Final

Remedial Investigation Report Munitions Response Site

Waikane Valley Impact Area Kaneohe, Hawaii

26 July 2011

Commander
Naval Facilities Engineering Command, Pacific
258 Makalapa Drive, Suite 100
Pearl Harbor, HI 96860-3134

Contract Number N62742-05-D-1868, CTO 0010

Final

Remedial Investigation Report Munitions Response Site

Waikane Valley Impact Area
Kaneohe, Hawaii

26 July 2011

Commander
Naval Facilities Engineering Command, Pacific
258 Makalapa Drive, Suite 100
Pearl Harbor, HI 96860-3134

Contract Number N62742-05-D-1868, CTO 0010

Executive Summary

Project Background and Objectives

This report documents the Remedial Investigation (RI) conducted in 2010 at the Munitions Response Site (MRS) located at Waikane Valley Impact Area (WVIA), Kaneohe, Oahu, Hawaii (Figure ES-1). Military activities at the site date back to the early 1940s, when the area was used by the U.S. Army for jungle training, field maneuvers, and a bombing range for air-to-ground ordnance delivery practice. During the 1940s and 1950s, the area was used by the U.S. Army and the U.S. Marine Corps (USMC) for small arms, artillery, and mortar firing practice. Firing activities were reportedly stopped in the early 1960s. Surface clearance of ordnance was conducted by the USMC and the Marine Explosive Ordnance Disposal (EOD) Program between 1976 and 1984. Clearance reports concluded at that time that 187 acres of the WVIA could never be certified free of unexploded ordnance.

An Investigation and Preliminary Range Assessment/Archives Search was conducted in 1998, and a Site Inspection (SI) was conducted in 2008. As a result of clearance and initial investigation activities, and to augment data collected during the SI, a Remedial Investigation/Feasibility Study (RI/FS) was deemed necessary.

This document represents the RI Report. It documents the activities conducted at the MRS to meet the following primary objectives:

- Identify safety hazards associated with munitions and explosives of concern (MEC)
- Evaluate the nature and extent of Munitions Constituents (MC) contamination
- Refine the conceptual site model
- Conduct a MEC Hazard Assessment (HA)
- Conduct an Environmental Hazard Evaluation (EHE)
- Characterize potential risks to human health and the environment posed by MCs in the site media (soil and stream sediment)

RI Activities and Summary of Results

The RI fieldwork was conducted between March and May 2010. Activities, including MEC clearance, soil and sediment sampling, laboratory analysis of samples, data evaluation, and hazard and risk assessments, focused on five Areas of Concern (AOCs) that were identified based on the results from the 2008 SI. The results provided below were obtained during the RI.

<u>Munitions and Explosives of Concern Investigation</u>

Approximately 11 acres (accessible areas with slopes 30 degrees or less) across AOC-01 through AOC-04 were surface cleared (see Figures ES-2 through ES-5) and a total of 25 grids (each approximately 1/16 acre in area) in AOCs 01 through 04 and five transects in AOC-05 (with a total length of 296 feet) (see Figures ES-2 through ES-6) were intrusively investigated down to a maximum depth of 4 feet below ground surface (bgs). The following table lists the number of MEC and material potentially presenting an explosive hazard (MPPEH) items found within each AOC, along with the field-estimated weights of material documented as safe (MDAS).

Summary of MEC, MPPEH, and MDAS found during Remedial Investigation

	Surface Clearance			**Intrusive Operations**		
AREA	**MEC**	**MPPEH**	**MDAS (lb)**	**MEC**	**MPPEH**	**MDAS (lb)**
AOC-1	0	0	0	0	0	2
AOC-2	2	1	665	0	0	128
AOC-3	15	90	3265	0	1	282
AOC-4	8	0	200	1	0	90
AOC-5	0	0	0	0	0	0
TOTALS	**25**	**91**	**4130**	**1**	**1**	**502**

No MEC, MPPEH, or MDAS were found in the southernmost part of the site, where all accessible areas were surveyed, including 2.92 acres of transects and grids during the SI and RI combined (see traversed tracks in Figure ES-7). Three items, found during the SI and removed during the RI, are assumed to have been carried out from the north side of the stream by trespassers. These items were found leaning against the fence, or a tree, near the access road, pointing in a direction incompatible with impact from the firing area. None of these three items were embedded in the topsoil or vegetation, and all were above the vegetation deadfall. Additionally, no MEC, MPPEH, or MDAS was observed during the RI daily activities, such as: trenching operations, composite sediment sampling of the entire length of the Waikane Stream within the MRS, field teams ingress and egress from target AOCs on a daily basis, or while the QC technicians walked through the entire site determining locations of slopes of 30 degrees or less.

The weights of MDAS reported in Table 3-3 were approximate weights estimated by team leaders while in the field and reported to the SUXOS on a daily basis. A total of 8,080 pounds of MD, generated from surface clearance and MEC blow in place (BIP) operations, were recovered from the AOCs, packaged, weighed on commercial scales, and shipped to and demilitarized/smelted at Timberline Environmental Services in California in accordance with applicable U.S. Department of Defense (DoD) guidelines and regulations.

The large difference in the weight originally reported by team leaders and the amount weighed before shipment is attributed to team leader estimating errors.

Munitions Constituent Investigation

Surface (0 to 0.5 foot bgs) and subsurface (0.5 to 3 feet bgs) soil samples were collected at 10 decision units (10 surface soil locations [with primary, duplicate and triplicate samples collected at each location] and 25 subsurface soil samples) and 10 BIP locations (total of 23 pre- and post-BIP surface samples) within AOC-01 through AOC-04, using a combination of multi-increment (MI) and discrete sampling methods. Samples were analyzed for selected metals and explosive compounds, identified as chemicals of potential concern (COPCs) from the SI. Results were evaluated against the State of Hawaii Department of Health (HDOH) direct exposure environmental action levels (EALs), the May 2010 U.S. Environmental Protection Agency (EPA) Residential Regional Screening Levels (RSLs), and the Koolau Volcanic Soil background concentrations. Concentrations of copper, antimony, and 2,4,6-trinitrotoluene (TNT) were detected in surface soils (Figures ES-8 and ES-9) above the site-specific EALs and the background levels. These concentrations appear to be associated with past firing activities conducted at the MRS (copper, antimony, and TNT) and possibly to BIP operations (copper). Concentrations of contaminants in subsurface soil were below site-specific EALs.

Four sediment samples were also collected between 0 and 0.5 foot bgs, within three sections of the Waikane Stream (AOC-05). Sediment samples were analyzed for metals and the explosive compound hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). Results were compared to the lowest effect level (LEL)-based National Oceanic and Atmospheric Administration (NOAA) Sediment Quality Guidelines. Copper was detected above the NOAA screening level of 16 milligrams per kilogram (mg/kg) in four out of four samples, with consistent concentrations between 95 mg/kg and 110 mg/kg, along AOC-05 (Figure ES-10). Concentrations were below the Koolau volcanic soil background levels and could be associated with copper-contaminated soil particles transported by stormwater run-off water from the southern portions of AOC-02 through AOC-04, where the highest concentrations of copper in surface soil were found, to the stream sediments.

Environmental Hazard Evaluation

Based on the results of the EHE, the potential hazards identified at the site are associated with human direct exposure due to antimony, copper, and TNT concentrations in surface soil above the direct exposure EALs. The volume of soil estimated with potential direct exposure hazards is 7,420 cubic yards (Figure ES-11). The potential hazards to human and ecological receptors associated with exposure to antimony, copper, and TNT are further evaluated in the Baseline Risk Assessment.

Munitions and Explosives of Concern Hazard Assessment

Based on MEC risks identified during the SI and RI investigations, the number and configuration of AOCs is revised. The WVIA MRS now consists of three AOCs (Southern Area, Target Area, and Non-Target Area) as shown in Figure ES-13. The Southern Area, located south of Waikane Stream (approximately 34 acres), appears to be free of MEC.

North of Waikane Stream the MEC appears to be concentrated in a Target Area of approximately 47 acres, located generally across the original AOC-02 through AOC-04. The MEC HA tool classified this Target Area as a high potential explosive hazard area (hazard level 2) for current and reasonably anticipated future land uses, and as moderate potential explosive hazard area (hazard level 3) if surface or surface/subsurface clearance alternatives are implemented. The remaining Non-Target Area (approximately 106 acres and with slopes generally greater than 30 degrees) is located to the north and west of the Target Area, and was found to contain less MEC. This Non-Target Area was classified as a moderate potential explosive hazard area (hazard level 3) for current and reasonably anticipated future land uses, and as low potential explosive hazard area (hazard level 4) if surface or surface/subsurface clearance alternatives are implemented.

Tier 2 Baseline Risk Assessment

The baseline risk assessment included a human health risk assessment (HHRA) and an ecological risk assessment (ERA) to estimate potential risks to humans and ecological receptors posed by detected MCs in soil and stream sediment (groundwater is not considered a pathway of concern for the site). The HHRA evaluated the hypothetical future residential land use scenario, the future construction worker scenario, and the future recreational land use scenario (Figure ES-12). For human health, the estimated hazard index for non-carcinogenic chemicals, the excess lifetime cancer risks, and the concentrations of lead in soil were all below regulatory threshold values or action levels. This indicates that, based on the available data, there are no potentially unacceptable risks posed to current and future human receptors at the MRS.

The ERA evaluated potential risks to avian wildlife (the Hawaiian short-eared owl or *Pueo*) and aquatic habitats in Waikane Stream. For avian wildlife, copper concentrations resulted in an ecological hazard quotient (HQ) for the *Pueo* of 1.3, slightly above the target threshold of 1.0. However, this HQ is based on a high toxicity reference value (TRV) and is strongly affected by an outlier detected copper concentration of 5,000 mg/kg from one location within the southern portion of AOC-03. This sample was a triplicate MI sample with the other two samples reporting concentrations of 25 mg/kg and 350 mg/kg. When considering a TRV calculated using the lowest observed adverse effects level of 12.1 mg/kg-day and/or excluding the outlier copper concentration, the estimated HQ would be well below the regulatory target threshold of 1.0. The aggregate ecological risk calculated for toxicologically-similar munitions-related compounds resulted in a HI of 0.02, well below the regulatory limit of 1.0. For aquatic receptors in Waikane Stream, the metals concentrations in sediment were below the probable effect concentrations (PECs) for sediment in fauna. Based on RI and SI data, potential risks posed to ecological receptors at the MRS are within acceptable levels.

Conclusions and Recommendations

Based on the 2008 SI and 2010 RI findings, the detected concentrations of MCs in soil and sediment at the MRS do not pose potentially unacceptable risks to human or ecological receptors under current, or reasonably anticipated future land uses. However, MEC hazards must be addressed for all portions of the MRS. For feasibility study (FS) purposes, the MRS is characterized as three AOCs as shown on Figure ES-13. Response alternatives are recommended below for each of the AOCs, and the potential future land uses allowed by Department of Defense as a result of these actions are also provided.

Southern Area

An FS should be conducted considering DoD-EPA UXO Management Principles to evaluate the appropriate response action to be implemented in the 34-acre area located in the southernmost part of the site (south of the division line shown in Figure 8-1). This area has been extensively assessed during the SI and RI investigations, surveying all accessible areas (covering a total of 2.92 acres of transects). No evidence of MEC or MPPEH was observed during transects or other activities, except for three items assumed to have been carried out from the north side of the stream by trespassers. The three items were removed during the RI. The following response action alternatives should be analyzed for the FS:

- No Action. Under this alternative, the current fence remains in place and no land transfer is accomplished.
- Land use controls (LUCs). The LUC alternative includes removing the existing fence, providing signage and deed restrictions, and considers construction support if intrusive activities are planned. No land transfer would be allowed under this alternative.
- Surface clearance with LUCs. The surface clearance considers 100% clearance of MEC from the ground surface in the Southern Area. This alternative could result in land transfer which is restricted to light agricultural or recreational use. Construction support would be required for any planned excavations.
- Surface and subsurface clearance with LUCs. This alternative involves 100% surface and subsurface clearance of MEC from all accessible areas within the Southern Area. Land transfer for possible residential use is possible under this alternative, although construction support would be required for excavations. Maximum depth of clearance is recommended at 2 feet, since the RI subsurface investigations showed that no excavations for MEC exceeded the 2-foot depth.

Target Area

An FS should be conducted to evaluate the most-cost effective response actions to be implemented in the 47-acre area located in the northern part of the site to address the moderate to high explosive hazards. The following alternative response actions should be considered in the FS:

- No Action. Under this alternative, the current fence remains in place and no land transfer is accomplished.
- LUCs. The LUC alternative includes signage and fencing around the Target Area to separate it from the Southern Area and the Non-Target Area. Land transfer would not be accomplished under this alternative.
- LUCs with construction support. This alternative includes signage and deed restrictions, and considers construction support if intrusive activities are planned. No land transfer would be allowed under this alternative.

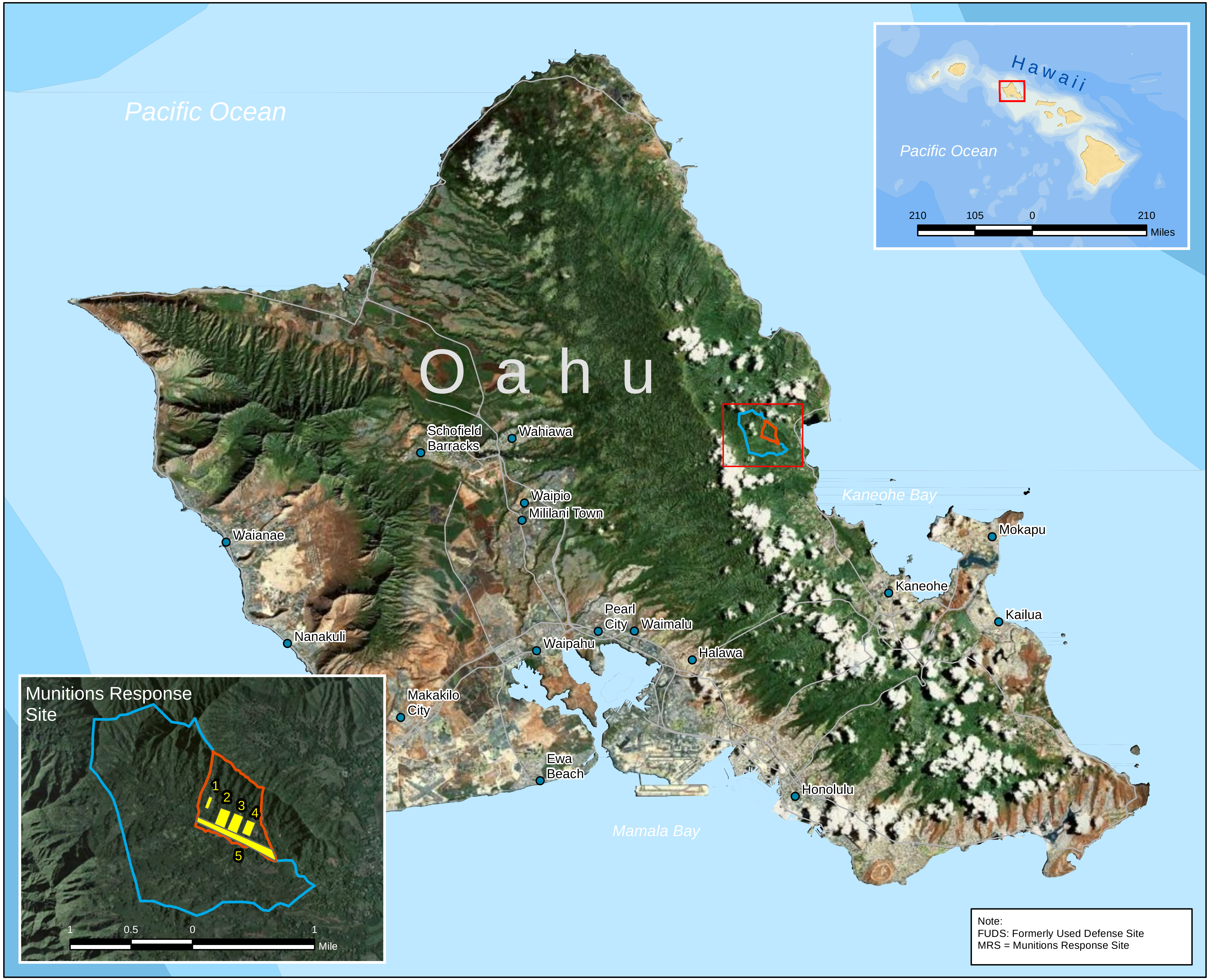
- Surface clearance (of accessible land) with LUCs. The surface clearance considers clearance of MEC from the ground surface that is reachable without exposing the remediation workers to undue slip, trip, or fall hazards. Since it is probable that not all MEC would be found due to the rough terrain, residual MEC risk would remain on the surface. However, land transfer is possible under this alternative, although it would be restricted to light agricultural or recreational uses. Construction support would be required for any planned excavations.
- Surface and subsurface clearance (of accessible land) with LUCs. This alternative involves surface and subsurface clearance of MEC from all accessible areas within the Target Area. Since it is probable that not all MEC would be found due to the rough terrain, land transfer would be possible only for light agricultural or recreational use, and construction support would be required for excavations. Maximum depth of clearance is recommended at 2 feet, since the RI subsurface investigations showed that no excavations for MEC exceeded the 2-foot depth.
- Surface and subsurface clearance of known Cultural Sites, with LUCs. This alternative considers 100% surface and subsurface clearance of the known cultural sites in the Target Area, along with access lanes. The only two sites affected by this alternative are the Kamaka Family Shrine and the Waikane Spring. Again, if land transfer were possible, it would be restricted to light agricultural or recreational use.

<u>**Non-Target Area**</u>

An FS should be conducted to evaluate the most-cost effective response actions to be implemented in the 106-acre Non-Target Area located in the northern part of the site to address the moderate explosive hazards. The following alternative response actions should be considered in the FS:

- No Action. Under this alternative, the current fence remains in place and no land transfer is accomplished.
- LUCs. The LUC alternative includes signage and fencing to separate the Non-Target Area from the Southern Area only. Land transfer would not be accomplished under this alternative.
- LUCs with construction support. This alternative includes signage and deed restrictions, and considers construction support if intrusive activities are planned. No land transfer would be allowed under this alternative.
- Surface clearance (of accessible land) with LUCs. The surface clearance considers clearance of MEC from the ground surface that is reachable without exposing the remediation workers to undue slip, trip, or fall hazards. Since it is probable that not all MEC would be found due to the rough terrain, residual MEC risk would remain on the surface. However, land transfer is possible under this alternative, although it would be restricted to light agricultural or recreational uses. Construction support would be required for any planned excavations.
- Surface and subsurface clearance (of accessible land) with LUCs. This alternative involves surface and subsurface clearance of MEC from all accessible areas within the Target Area. Since it is probable that not all MEC would be found due to the rough terrain, land transfer would be possible only for light agricultural or recreational use, and construction support would be required for excavations.

Maximum depth of clearance is recommended at 2 feet, since the RI subsurface investigations showed that no excavations for MEC exceeded the 2-foot depth.



N

4 2 0 4
Miles

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-1

Site Location

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- City
- Major Road
- Area of Concern
- Waikane MRS Boundary
- Ocean

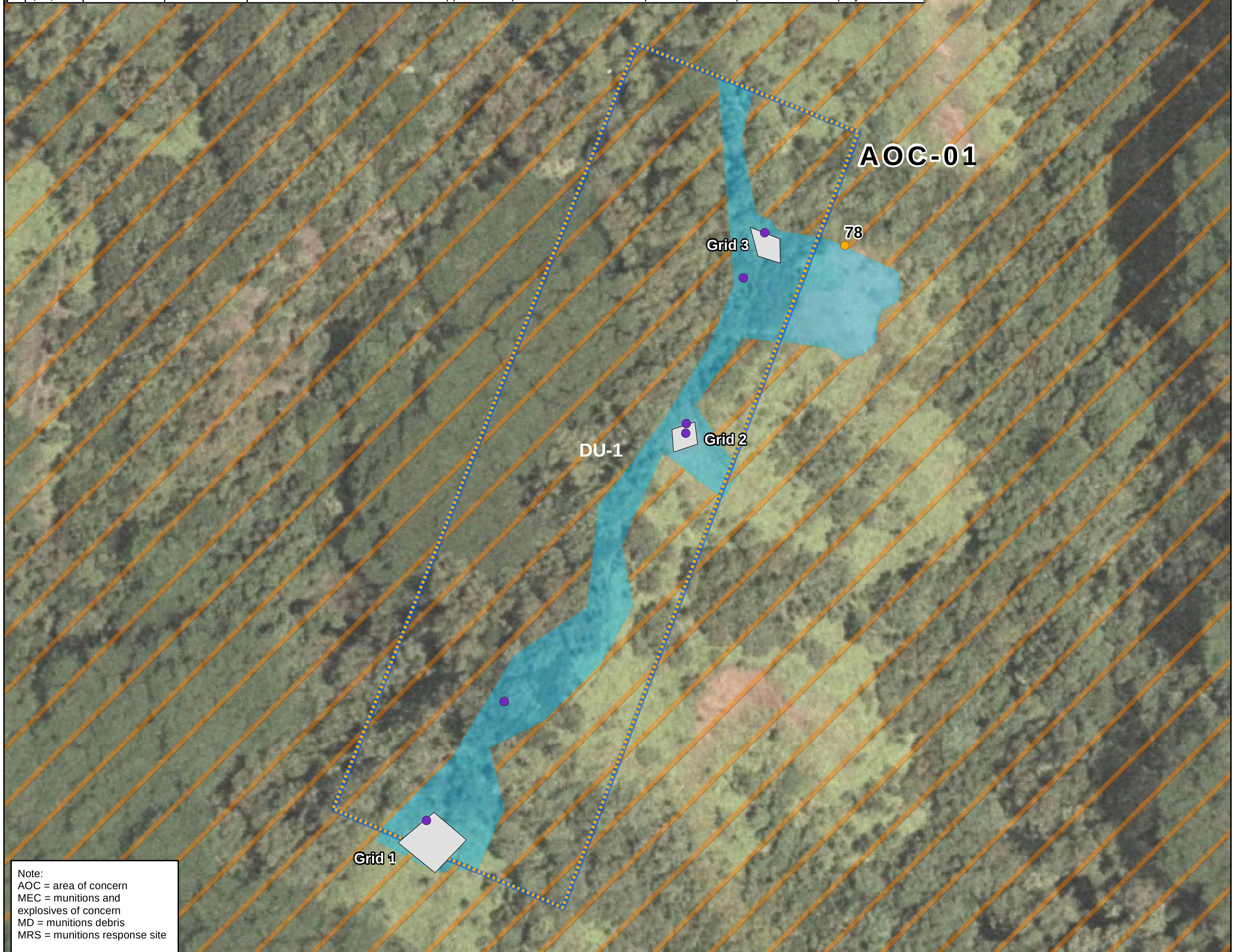
USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM/JAL	Scale: 1 inch = 4 miles		Rev: 2
Checked By: SC	Date Drawn: 07/19/10		
Submitted By: JC	Revision Date: 2-24-2011		
	Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG1-1_SITE_LOCATION.MXD RMANGAN 7/20/2010 09:25:01

ID	Date	Anomaly Type	Anomaly Class	Comments
78	4/14/2010	Small Arms	MD	Point taken identifies a surface area approximately 30 ft in diameter densely covered with expended small arms projectiles.



Note:
AOC = area of concern
MEC = munitions and explosives of concern
MD = munitions debris
MRS = munitions response site

N

60 30 0 60

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-2

AOC-01 Layout & MEC Findings

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Munitions Debris
- Seed Item
- Area of Concern
- Cleared Area (<30 Degree Slope Area)
- >30 Degree Slope Area
- Decision Unit
- Intrusive Test Grid
- Waikane MRS Boundary
- Waikane Stream

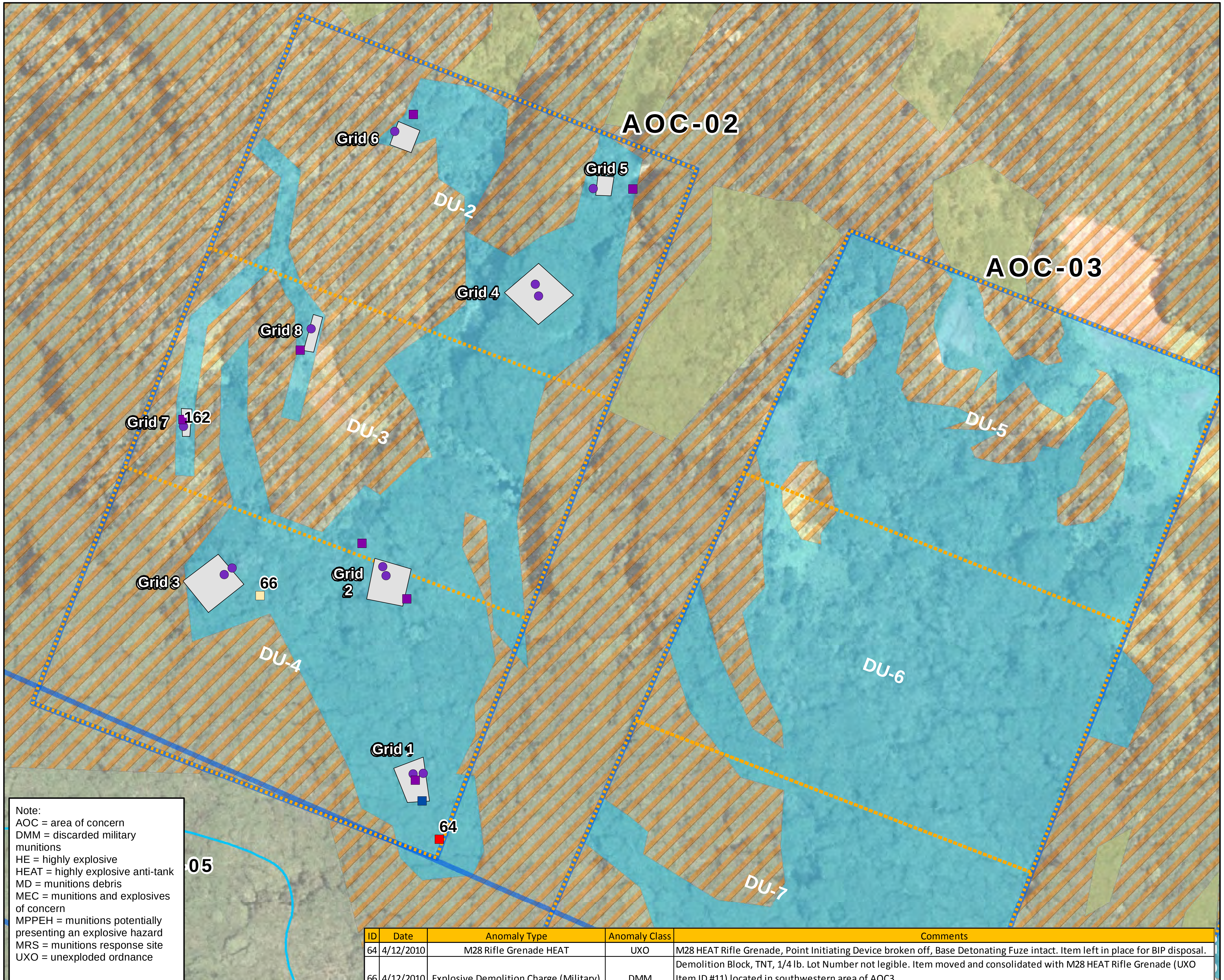
USA Environmental, Inc.

Drawn By: RM/JAL	Scale:	Rev: 2
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 2/28/2011	
	Path:	

Figure ES-3

AOC-02 Layout & MEC Findings

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i



Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Legend

Surface Clearance
- DMM
- MD Consoliidation
- UXO
- Seed Item
- Seed Item

- Area of Concern
- Cleared Area (<30 Degree Slope Area)
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Decision Unit
- Intrusive Test Grid
- Waikane Stream

Note:
AOC = area of concern
DMM = discarded military munitions
HE = highly explosive
HEAT = highly explosive anti-tank
MD = munitions debris
MEC = munitions and explosives of concern
MPPEH = munitions potentially presenting an explosive hazard
MRS = munitions response site
UXO = unexploded ordnance

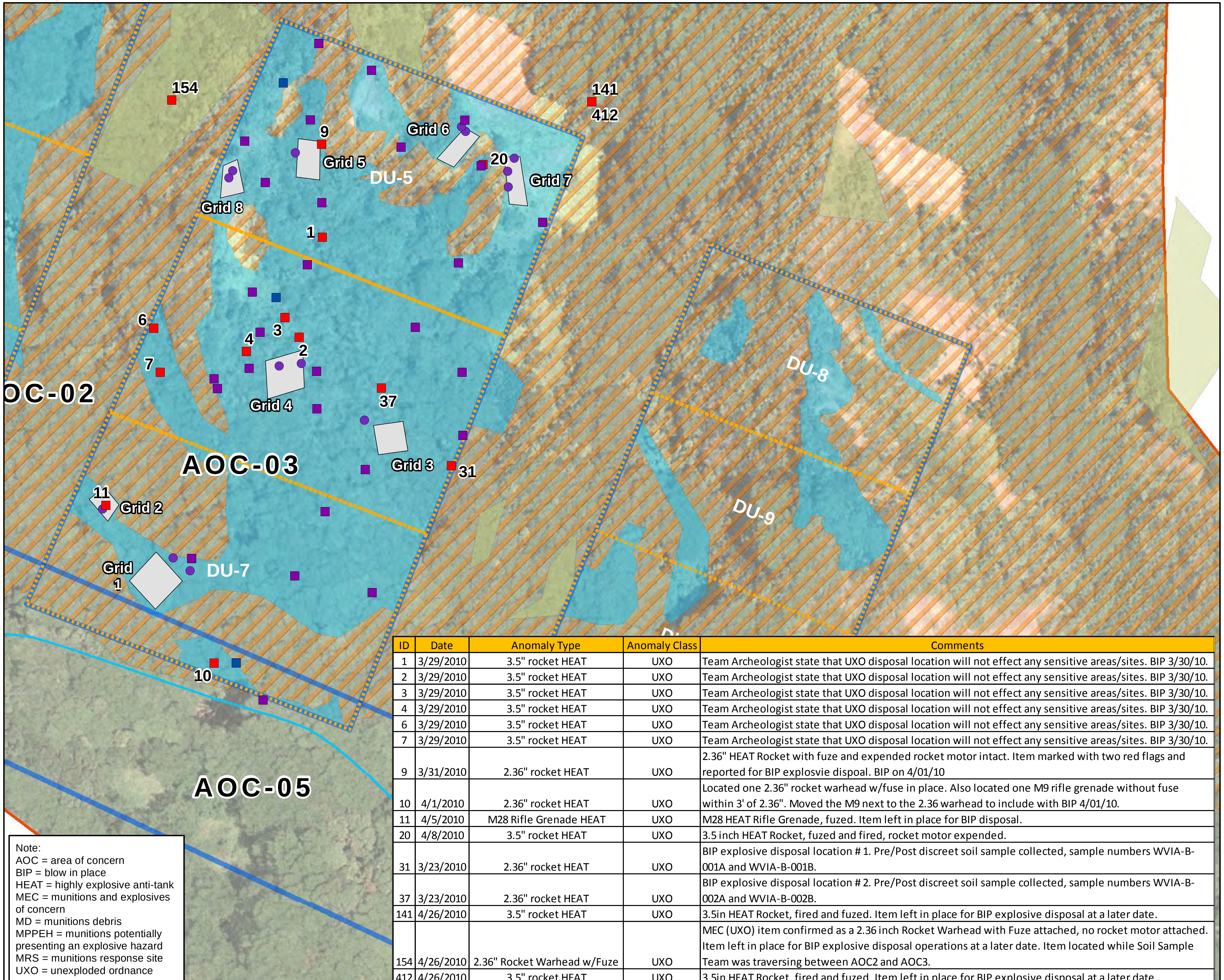
ID	Date	Anomaly Type	Anomaly Class	Comments
64	4/12/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, Point Initiating Device broken off, Base Detonating Fuze intact. Item left in place for BIP disposal.
66	4/12/2010	Explosive Demolition Charge (Military)	DMM	Demolition Block, TNT, 1/4 lb. Lot Number not legible. Item moved and consolidated with M28 HEAT Rifle Grenade (UXO Item ID #11) located in southwestern area of AOC3.

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM/JAL	Scale: 1 inch = 100 feet	Rev: 2	
Checked By: SC	Date Drawn: 07/16/10		
Submitted By: JC	Revision Date: 2-24-2011		
Path:			

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-2_AOC-2.MXD RMANGAN 10/4/2010 09:14:08



ID	Date	Anomaly Type	Anomaly Class	Comments
1	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
2	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
3	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
4	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
6	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
7	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
9	3/31/2010	2.36" rocket HEAT	UXO	2.36" HEAT Rocket with fuze and expended rocket motor intact. Item marked with two red flags and reported for BIP explosvie dispoal. BIP on 4/01/10
10	4/1/2010	2.36" rocket HEAT	UXO	Located one 2.36" rocket warhead w/fuse in place. Also located one M9 rifle grenade without fuse within 3' of 2.36". Moved the M9 next to the 2.36 warhead to include with BIP 4/01/10.
11	4/5/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
20	4/8/2010	3.5" rocket HEAT	UXO	3.5 inch HEAT Rocket, fuzed and fired, rocket motor expended.
31	3/23/2010	2.36" rocket HEAT	UXO	BIP explosive disposal location # 1. Pre/Post discreet soil sample collected, sample numbers WVIA-B-001A and WVIA-B-001B.
37	3/23/2010	2.36" rocket HEAT	UXO	BIP explosive disposal location # 2. Pre/Post discreet soil sample collected, sample numbers WVIA-B-002A and WVIA-B-002B.
141	4/26/2010	3.5" rocket HEAT	UXO	3.5in HEAT Rocket, fired and fuzed. Item left in place for BIP explosive disposal at a later date.
154	4/26/2010	2.36" Rocket Warhead w/Fuze	UXO	MEC (UXO) item confirmed as a 2.36 inch Rocket Warhead with Fuze attached, no rocket motor attached. Item left in place for BIP explosive disposal operations at a later date. Item located while Soil Sample Team was traversing between AOC2 and AOC3.
412	4/26/2010	3.5" rocket HEAT	UXO	3.5in HEAT Rocket, fired and fuzed. Item left in place for BIP explosive disposal at a later date.

N

125 62.5 0 125

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-4

AOC-03 Layout & MEC Findings

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

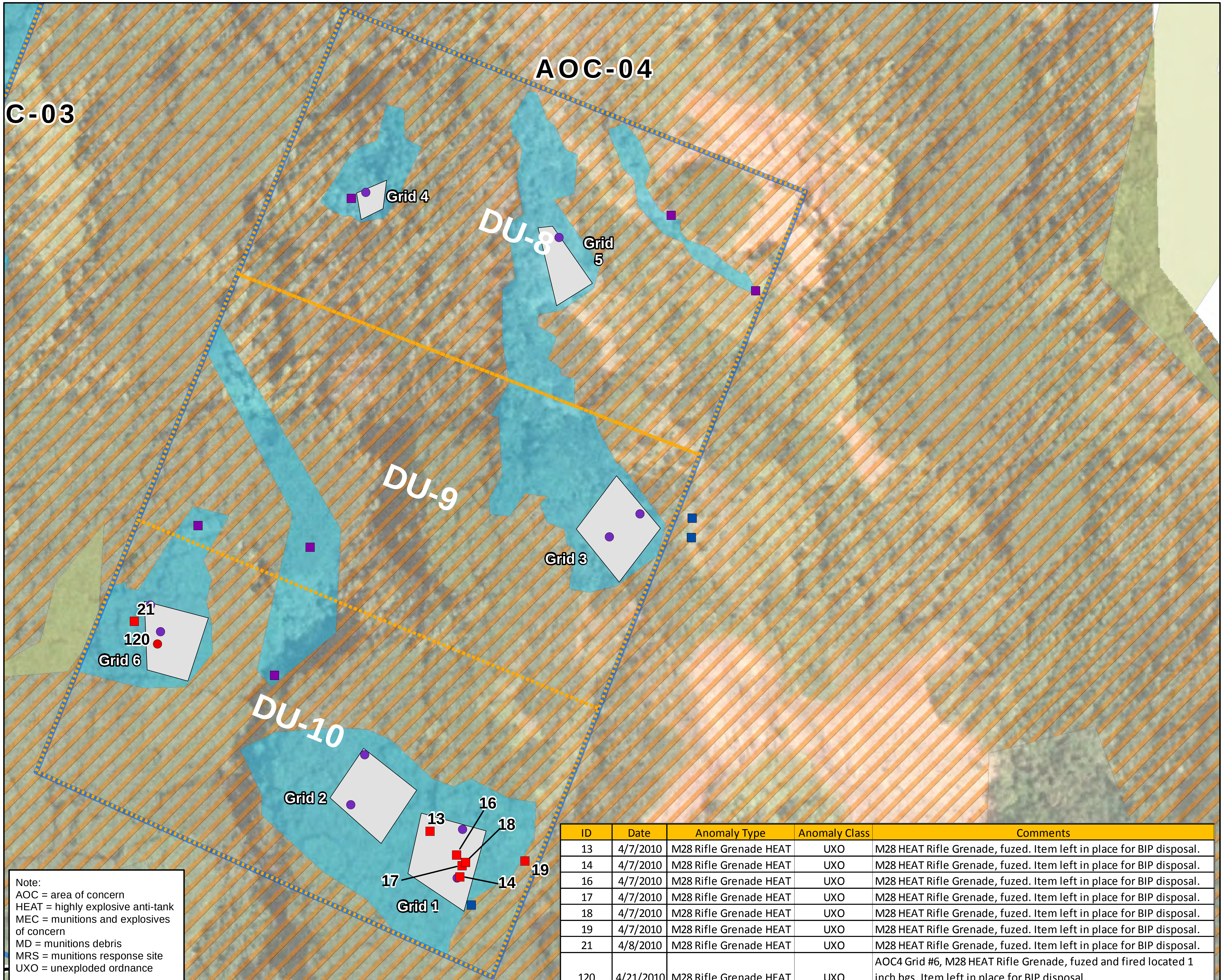
Surface Clearance
- MD Consoliidation
- UXO
- Seed Item
- Seed Item
- Intrusive Test Grid
- Decision Unit
- Area of Concern
- Cleared Area (<30 Degree Slope Area)
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM/JAL	Scale: 1 inch = 125 feet	Rev: 2
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 2-24-2011	
Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-3_AOC-3.MXD RMANGAN 10/4/2010 09:14:08



ID	Date	Anomaly Type	Anomaly Class	Comments
13	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
14	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
16	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
17	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
18	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
19	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
21	4/8/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
120	4/21/2010	M28 Rifle Grenade HEAT	UXO	AOC4 Grid #6, M28 HEAT Rifle Grenade, fuzed and fired located 1 inch bgs. Item left in place for BIP disposal.

Note:
AOC = area of concern
HEAT = highly explosive anti-tank
MEC = munitions and explosives of concern
MD = munitions debris
MRS = munitions response site
UXO = unexploded ordnance

N

70 35 0 70
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-5

AOC-04 Layout & MEC Findings

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

Surface Clearance
- MD Consoliidation
- UXO
- Seed Item

Subsurface Clearance
- UXO
- Seed Item

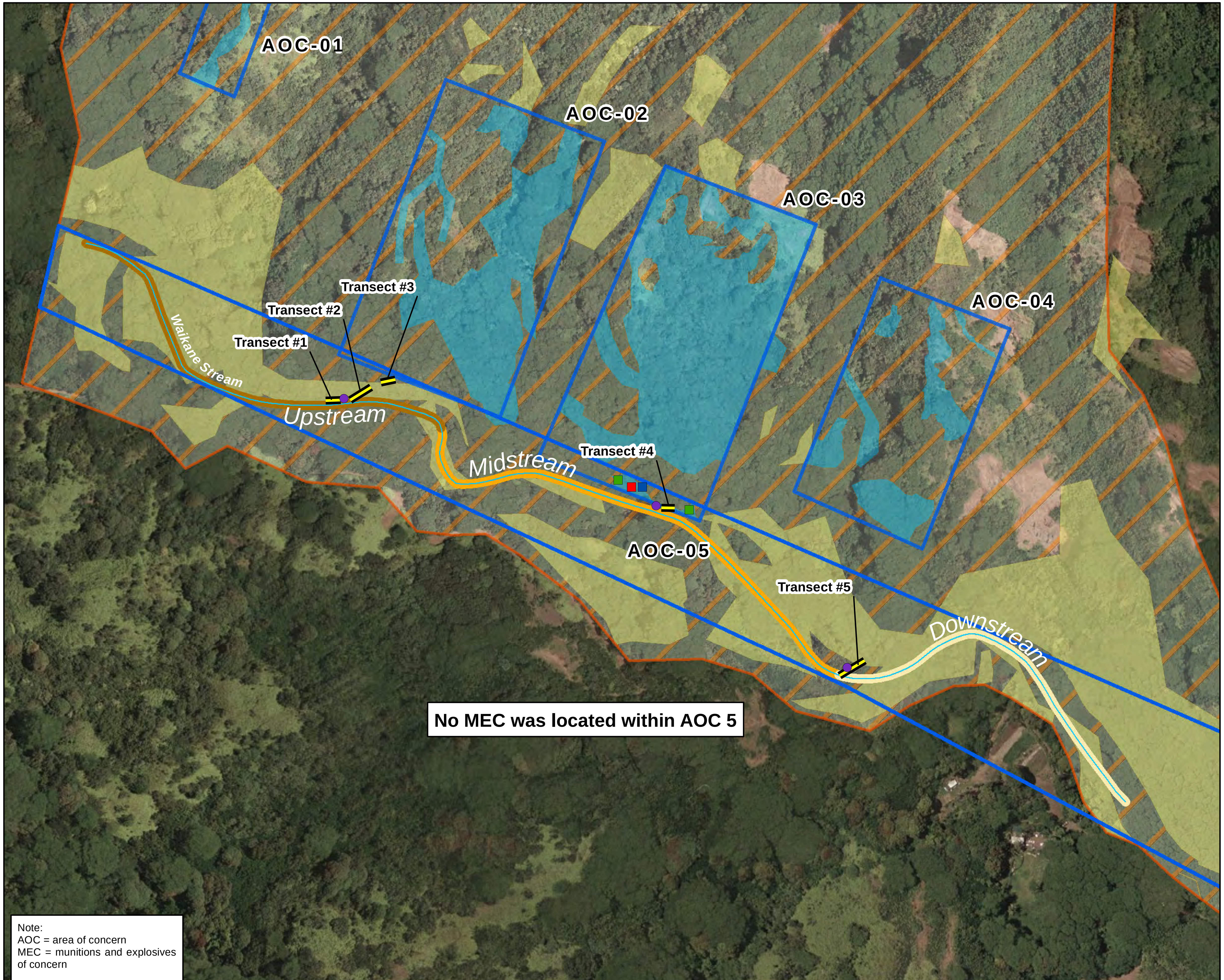
- Intrusive Test Grid
- Decision Unit
- Area of Concern
- Cleared Area (<30 Degree Slope Area)
- >30 Degree Slope Area
- < 30 Degree Slope Area

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM/JAL	Scale: 1 inch = 70 feet	Rev: 2
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 2-24-2011	
Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-4_AOC-4.MXD RMANGAN 10/4/2010 09:14:08



N

250 125 0 250

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-6

AOC-05 Layout & MEC Findings

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

AOC 3 Surface Items
- MD
- MD Consoliidation
- MPPEH
- UXO
- Seed Item

AOC 5 Subsurface Items
- Seed Item

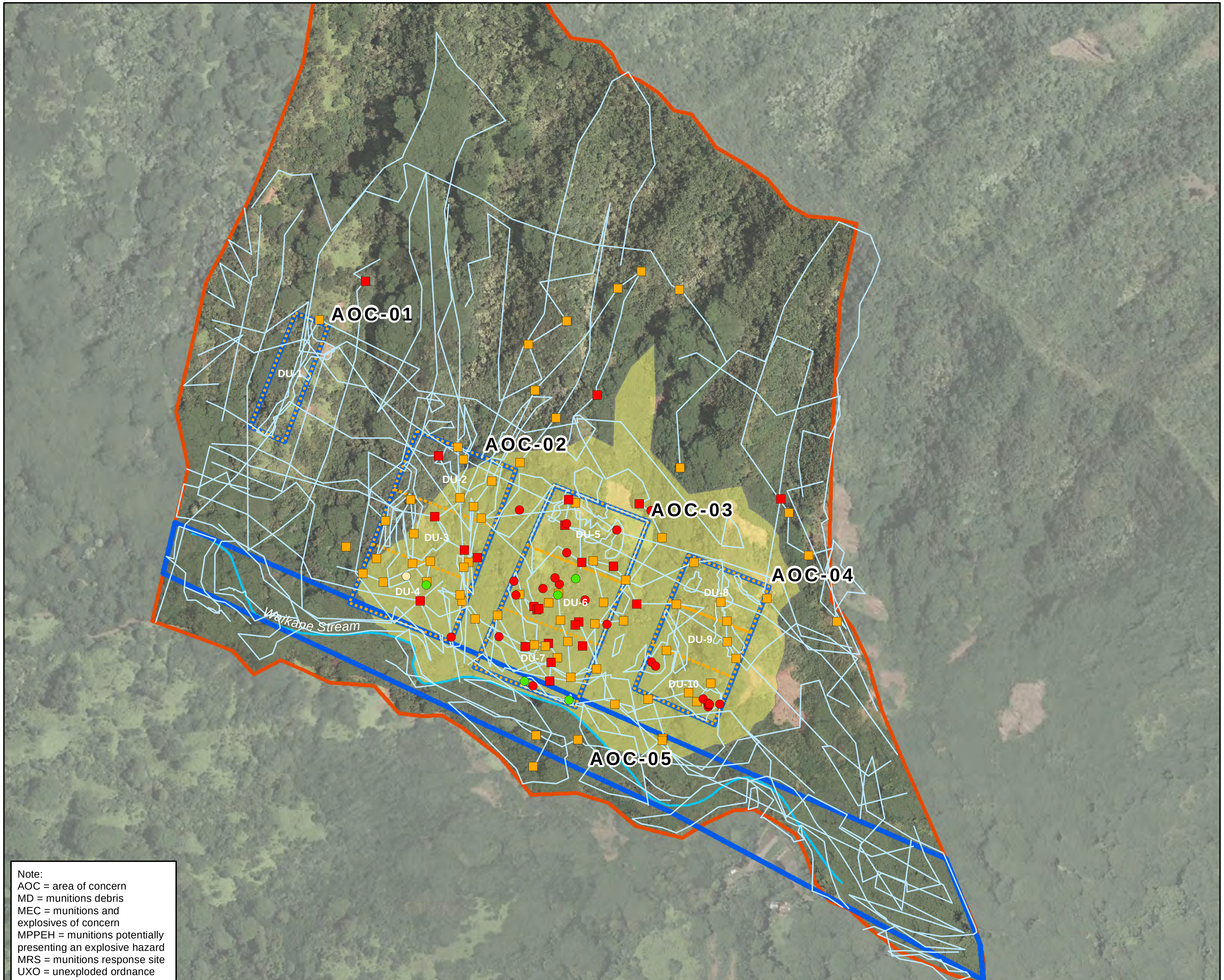
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (<30 degree slope)
- Intrusive Transect
- Area of Concern
- Waikane Stream
- Upstream
- Midstream
- Downstream
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 250 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/01/10	
	Path:	

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-5_AOC-5.MXD RMANGAN 7/28/2010 14:22:34



N

400 200 0 400

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-7

MEC Concentration Areas

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

SI MEC/MD Items
- MD
- UXO

RI MEC Items
- DMM
- MPPEH
- UXO

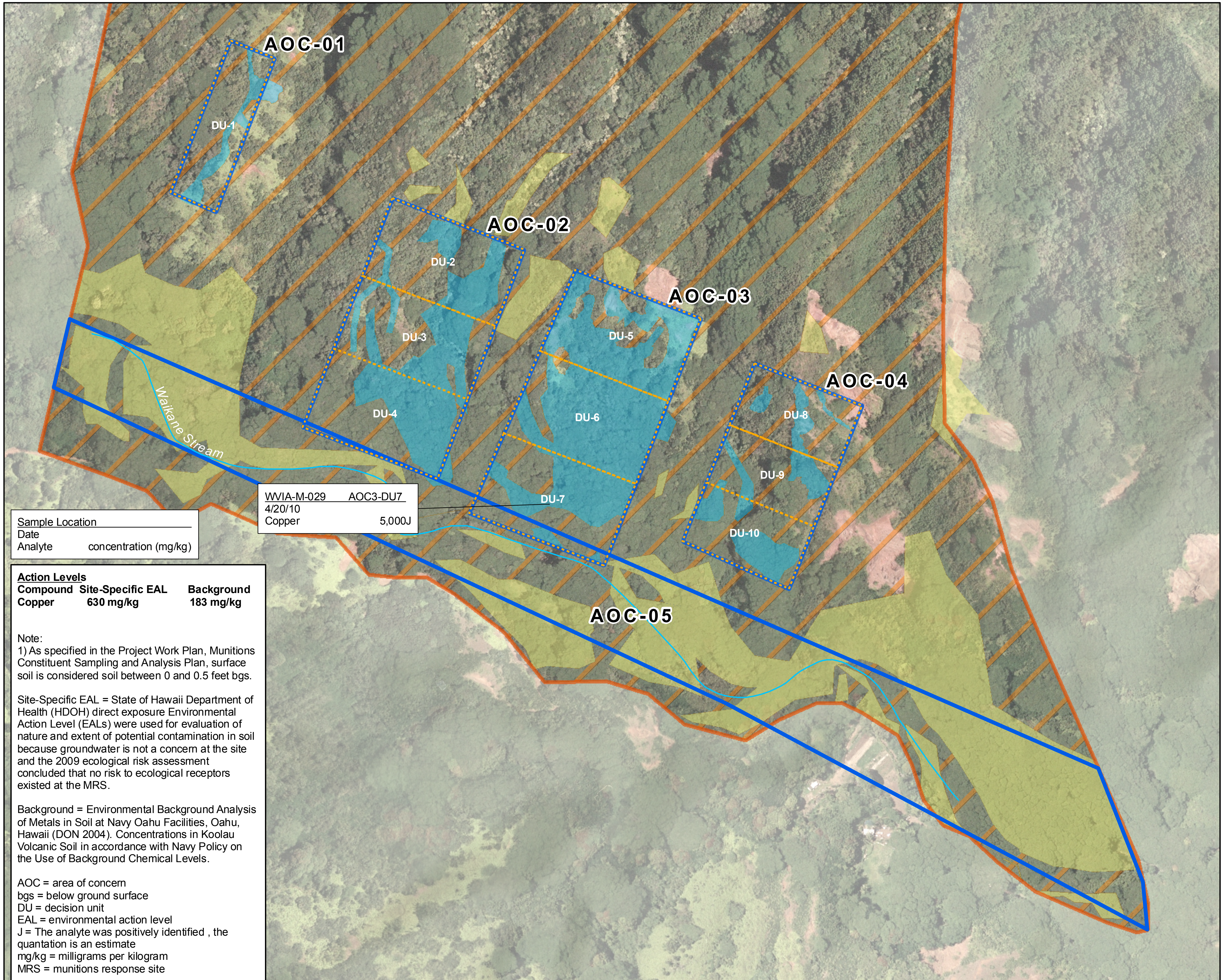
- SI/RI Traversed Track (13.1 ac.)
- Decision Units
- Approximate Munitions Concentrations Area
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 400 feet	Rev: 1
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 10/01/10	
Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG4-1_MEC_CONCENTRATION.MXD RMANGAN 7/19/2010 14:34:41



Action Levels

Compound	Site-Specific EAL	Background
Copper	630 mg/kg	183 mg/kg

Note:
1) As specified in the Project Work Plan, Munitions Constituent Sampling and Analysis Plan, surface soil is considered soil between 0 and 0.5 feet bgs.

Site-Specific EAL = State of Hawaii Department of Health (HDOH) direct exposure Environmental Action Level (EALs) were used for evaluation of nature and extent of potential contamination in soil because groundwater is not a concern at the site and the 2009 ecological risk assessment concluded that no risk to ecological receptors existed at the MRS.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii (DON 2004). Concentrations in Koolau Volcanic Soil in accordance with Navy Policy on the Use of Background Chemical Levels.

AOC = area of concern
bgs = below ground surface
DU = decision unit
EAL = environmental action level
J = The analyte was positively identified , the quantation is an estimate
mg/kg = milligrams per kilogram
MRS = munitions response site

N

300 150 0 300
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-8

Surface/Multi-Increment Soil Sample Exceedances

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Decision Units
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (< 30 Degree Slope)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

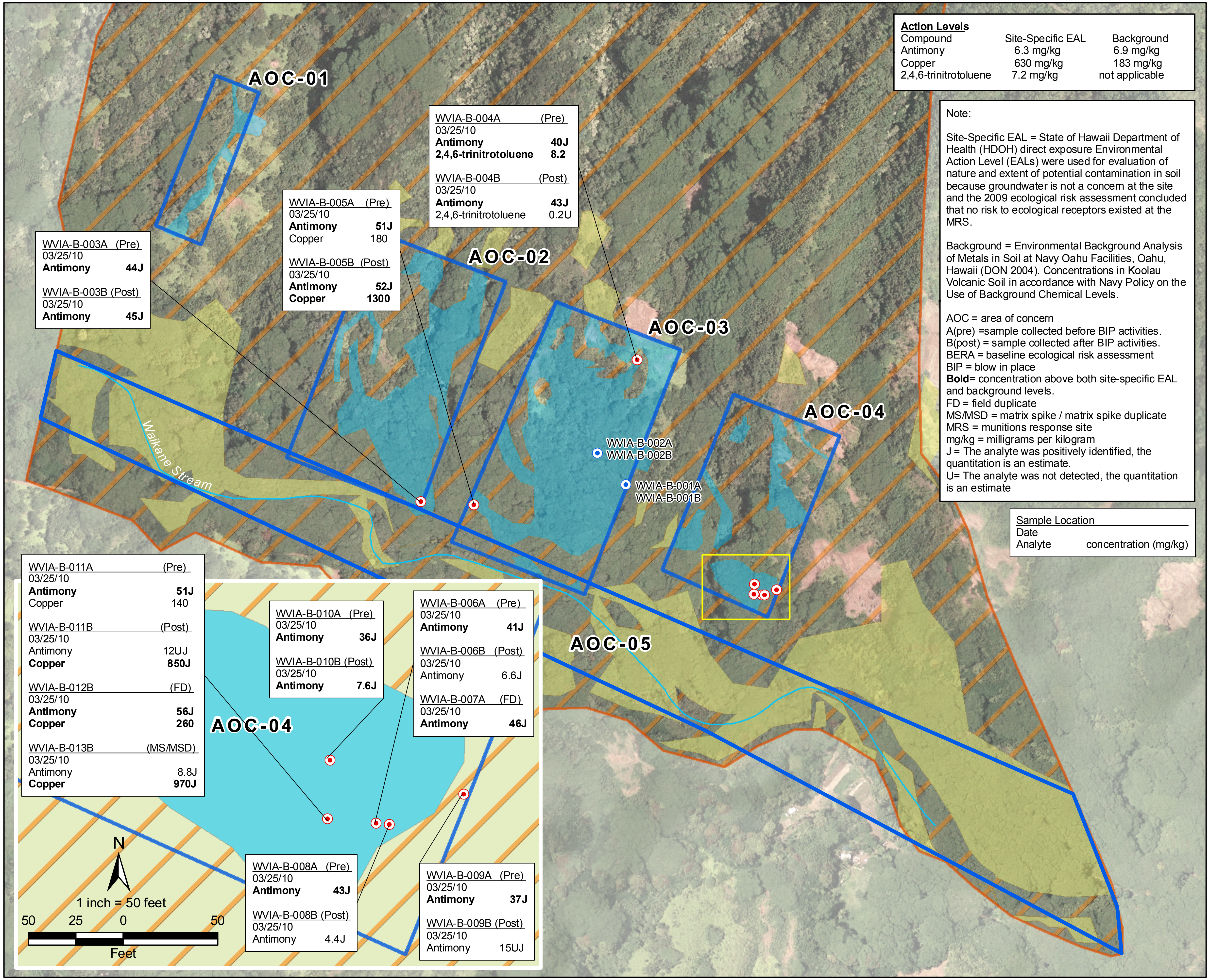
USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 300 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/01/10	

Path:

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG4-2_SURFACE_EXCEEDANCES.MXD RMANGAN 7/19/2010 14:54:10



N
300 150 0 300
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-9
Impact on Surface Soil from Blow In Place (BIP) Activities

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

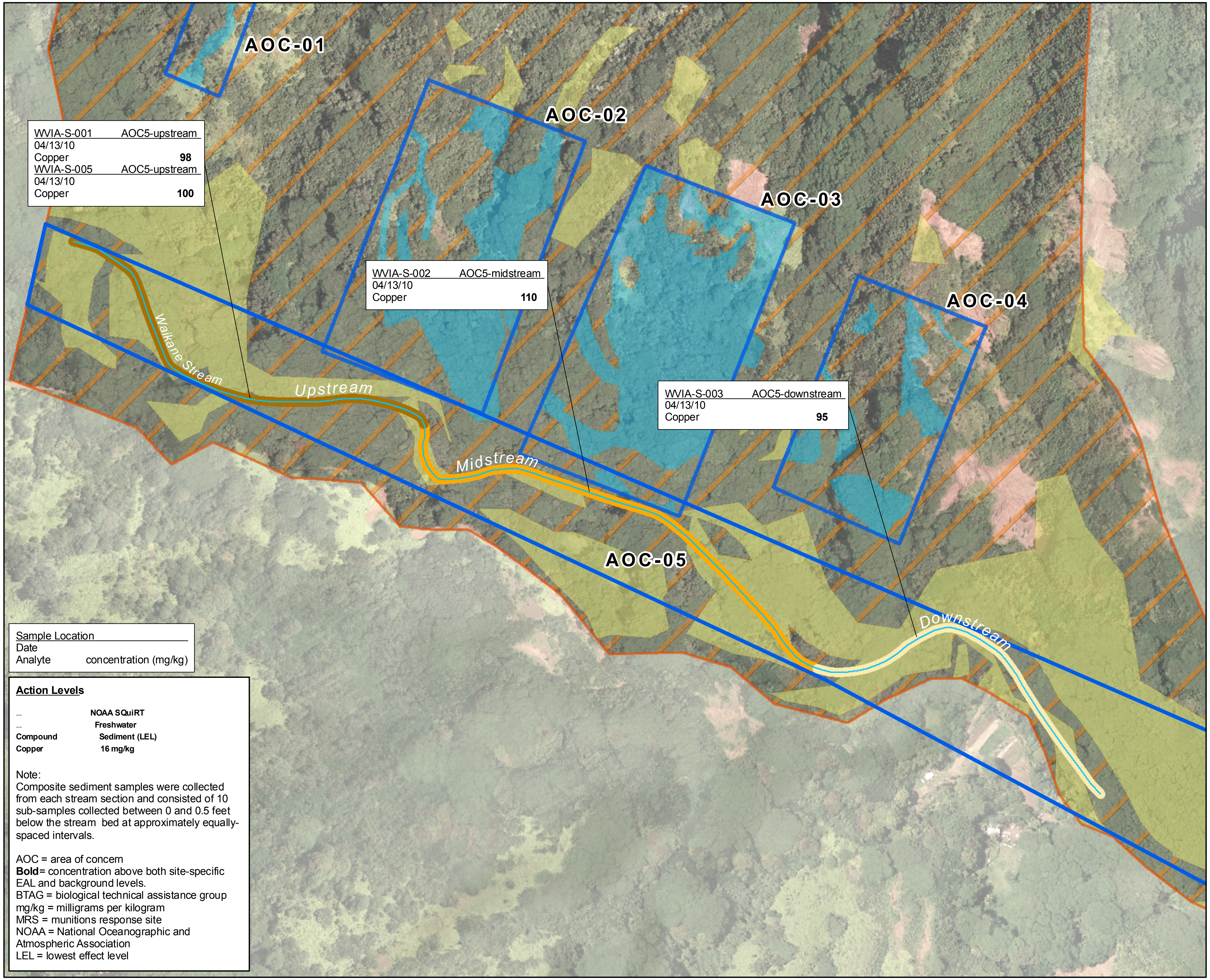
Legend
BIP Soil Sample Locations

- No Exceedance Detected
- Exceedance Detected
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (> 30 Degree Area)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.
NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 300 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/04/10	
Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG4-3_BIP_EXCEEDANCES.MXD RMANGAN 7/19/2010 15:40:21



Sample Location
Date
Analyte concentration (mg/kg)

Action Levels

...	**NOAA SQuiRT**
...	**Freshwater**
Compound	**Sediment (LEL)**
Copper	**16 mg/kg**

Note:
Composite sediment samples were collected from each stream section and consisted of 10 sub-samples collected between 0 and 0.5 feet below the stream bed at approximately equally-spaced intervals.

AOC = area of concern
Bold= concentration above both site-specific EAL and background levels.
BTAG = biological technical assistance group
mg/kg = milligrams per kilogram
MRS = munitions response site
NOAA = National Oceanographic and Atmospheric Association
LEL = lowest effect level

N

250 125 0 250
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-10

Sediment Sample Exceedances

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Upstream
- Midstream
- Downstream
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (<30 Degree Slope)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

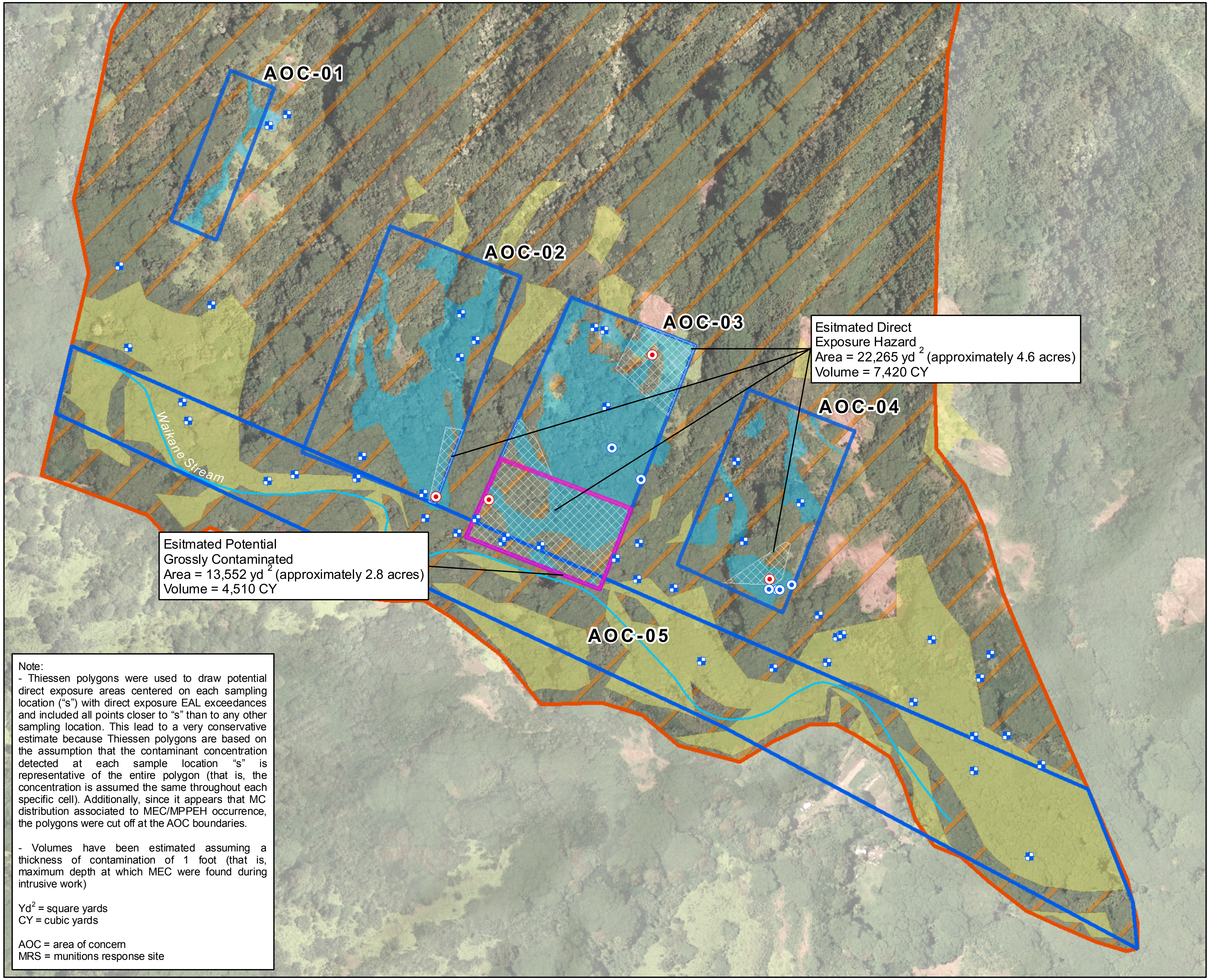
USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 250 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/04/10	

Path:

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG4-4_SEDIMENT_EXCEEDANCES.MXD RMANGAN 7/19/2010 16:01:00



Note:
- Thiessen polygons were used to draw potential direct exposure areas centered on each sampling location ("s") with direct exposure EAL exceedances and included all points closer to "s" than to any other sampling location. This lead to a very conservative estimate because Thiessen polygons are based on the assumption that the contaminant concentration detected at each sample location "s" is representative of the entire polygon (that is, the concentration is assumed the same throughout each specific cell). Additionally, since it appears that MC distribution associated to MEC/MPPEH occurrence, the polygons were cut off at the AOC boundaries.

- Volumes have been estimated assuming a thickness of contamination of 1 foot (that is, maximum depth at which MEC were found during intrusive work)

Yd^2 = square yards
CY = cubic yards

AOC = area of concern
MRS = munitions response site

N

300 150 0 300
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure ES-11

Environmental Hazard Evaluation Map

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

BIP Soil Sample Locations

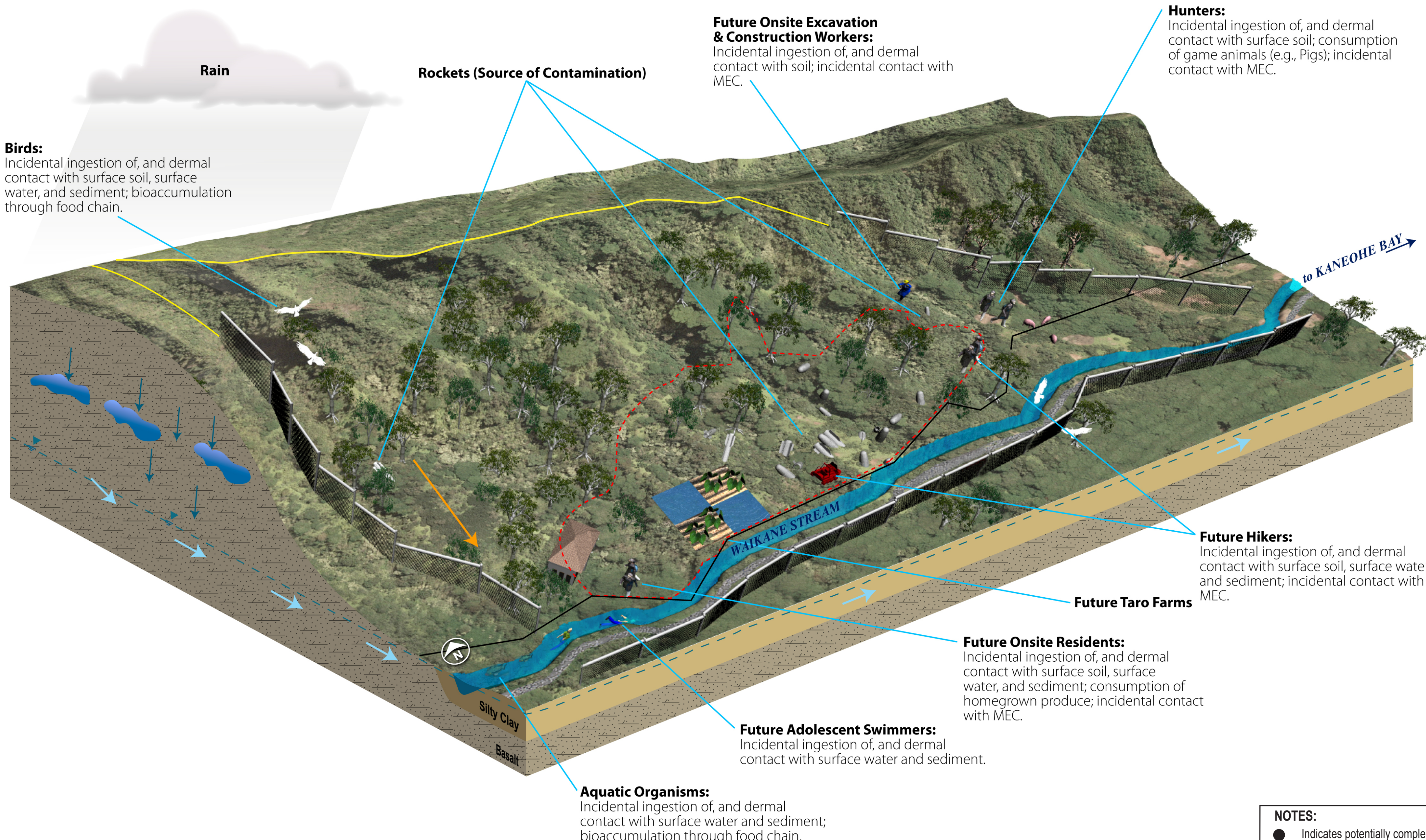
- No Exceedance Detected
- Exceedance Detected
- 2008 SI Soil Sample Location
- Potential Direct Exposure Hazard Area
- Potential Gross Contamination Hazard Area
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (<30 Degree Slope)
- Area of Concern
- Waikane Stream
- Waikane MRS Boundary

USA Environmental, Inc.

Drawn By: RM	Scale: 1 inch = 300 feet	Rev: 1
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 10/01/10	
	Path:	

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG5-1_ENVIROHAZARD.MXD RMANGAN 7/20/2010 16:42:25

Primary Source	Primary Release Mechanism	Secondary Source	Secondary Release Mechanism	Exposure Media	Exposure Route	Site Trespassers	Future Hikers/Swimmers (Recreational)	Future Excavation & Construction Workers	Future Residents	Aquatic & Terrestrial Eco Organisms
MEC from Military Firing Operations	MEC at Surface/Subsurface (down to 1 foot bgs)		Erosion/Run-off	MEC on Surface	Contact while Walking	●	●	●	●	○
	Explosion from Military Operations	Soil	Corrosion and Degradation	Surface Soil	Ingestion	●	●	●	●	●
					Inhalation	●	●	●	●	○
					Dermal Contact	●	●	●	●	●
			Erosion/Run-off	Surface Water/Sediment	Ingestion	●	●	○	○	●
					Dermal Contact	●	●	○	○	●
			Leaching	Perched Groundwater	Ingestion	○	○	○	○	○
					Dermal Contact	○	○	○	○	○



NOTES:
- ● Indicates potentially complete pathway.
- ○ Indicates an incomplete pathway.
- → Primary pathway.

Figure not drawn to scale

Figure ES-12

Conceptual Site Model

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

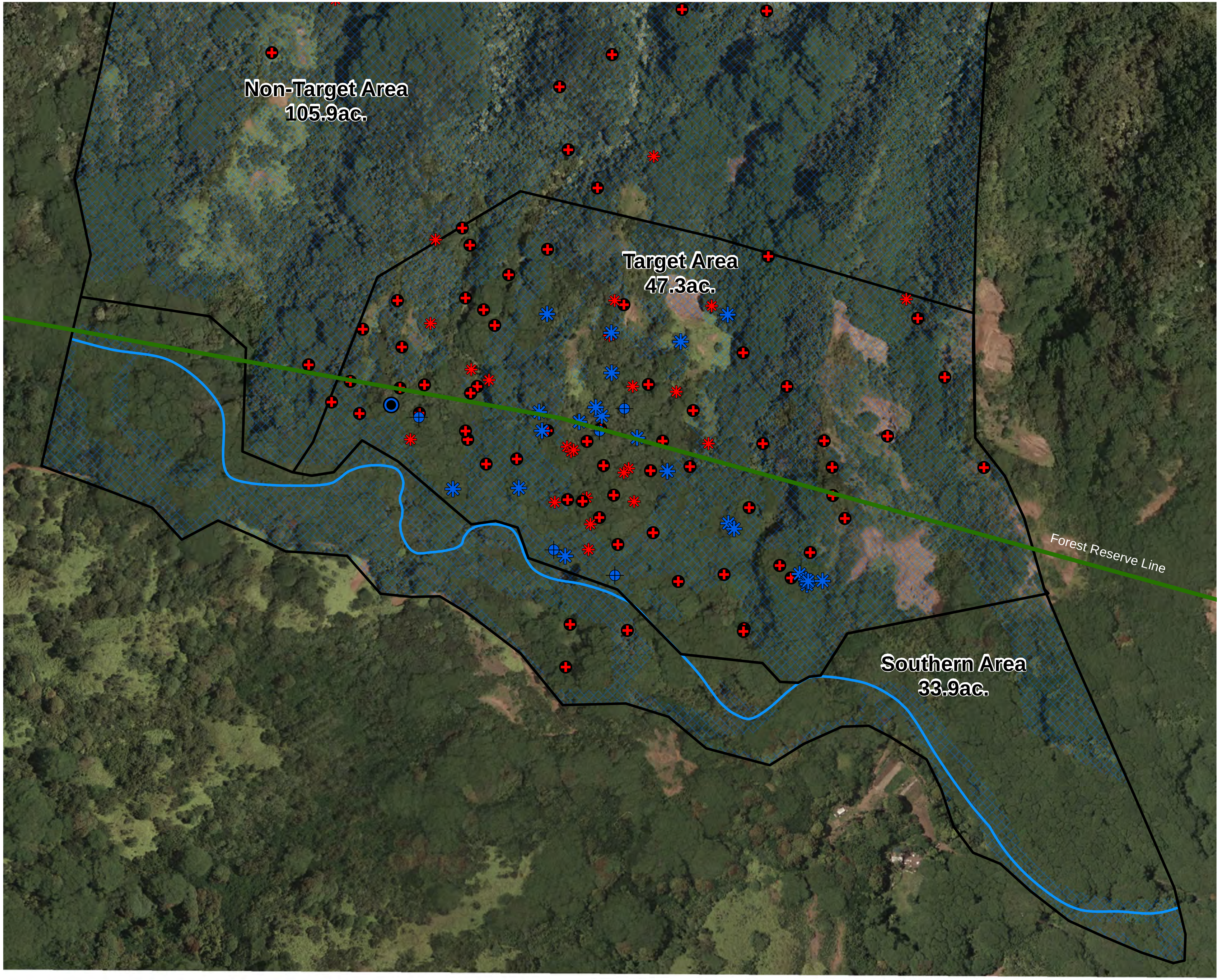
LEGEND

- Groundwater Flow Direction
- Infiltration
- Surface Runoff/Erosion
- Basal Groundwater Table
- Perched Groundwater
- Site Boundary
- MEC Munitions and Explosives of Concern
- Approximate Munitions Concentration Area
- Area south of this line could be suitable for potential unrestricted future land use

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM/MB	Scale:	Rev:
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date:	
Path:		



N

290 145 0 290

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

Figure ES-13

Areas Defined for Feasibility Study

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

2010 RI MEC Items
- DMM Point
- MPPEH Point
- MEC (UXO) Point

2008 SI MEC Items
- Munitions Debris Point
- MEC (UXO) Point
- Alternative fence line
- Waikane Boundary
- Waikane Stream
- > 30 Degree Slope Area

USA Environmental, Inc.

Drawn By:	SPC	Scale:	1 inch = 290 feet	Rev:
Checked By:	DM	Date Drawn:	3-08-2011	
Submitted By:	RN	Revision Date:		

Path: S:\Waikane\RIFS Status Maps\Land Use Map.mxd

Contents

Figures

Tables

Appendices

This page is intentionally left blank.

Abbreviations and Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
µg/dL	micrograms per deciliter
amsl	above mean sea level
AOC	Areas of Concern
ATSDR	Agency for Toxic Substances & Disease Registry
AUF	area-use factor
bgs	below ground surface
BERA	Baseline Ecological Risk Assessment
BIP	blow in place
BSI	blind seed item
BTAG	Biological Technical Assistance Group
COC	chemical of concern
COPC	constituents of potential concern
CSM	conceptual site model
CWM	Chemical warfare material
CY	cubic yard
DEI	Donaldson Enterprises International
DERP	Defense Environmental Restoration Program
DFW	definable features of work
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DoD	U.S. Department of Defense
DQO	data quality objectives
DU	decision unit
EA	Environmental Assessment
EAL	Environmental Action Level
EE/CA	Engineering Evaluation/Cost Analysis
EHE	Environmental Hazard Evaluation
ELCR	excess lifetime cancer risk
EOD	Explosive Ordnance Disposal
EPC	exposure point concentration
ERA	ecological risk assessment
ERT2	Environmental Restoration Technology Transfer
EZ	exclusion zones
FD	field duplicate

FS	Feasibility Study
FUDS	Formerly Used Defense Sites
GIS	geographical information system
GI	Gastrointestinal
GPS	global positioning system
HA	hazard assessment
HDOH	State of Hawaii Department of Health
HE	highly explosive
HEAST	Health Effects Assessment Summary Table
HEAT	high explosive anti-tank
HEER	Hazard Evaluation and Emergency Response
HHE	health hazard evaluation
HHRA	human health risk assessment
HnA	Hanalei silty clay, 0 to 2 percent slope
HQ	hazard quotient
INHS	Illinois Natural History Service
IRIS	Integrated Risk Information System
ISO	Industry Standard Object
ITS	instrument test strip
IUR	inhalation unit risk
Koc	carbon adsorption coefficient
Kow	water partition coefficient
LEL	lowest effect level
LOAEL	lowest observed adverse effect level
MC	Munitions Constituents
MCBH	Marine Corps Base Hawaii
MD	munitions debris
MDAS	material documented as safe
MDL	method detection limit
MEC	munitions and explosives of concern
mg/kg	milligram per kilogram
mg/kg-day	milligram per kilogram per day
MI	multi-increment
mm	Millimeter
mph	miles per hour
MPPEH	material potentially presenting an explosive hazard
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol

MS/MSD	matrix spike/matrix spike duplicate
MSDS	material safety data sheet
mV	Millivolt
NAVFAC-PAC	Naval Facilities Engineering Command Pacific
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observed adverse effects level
PEC	probable effect concentration
PEF	Particulate emission factor
PPRTV	Provisional Peer Reviewed Toxicity Value
QA/QC	quality assurance/quality control
RAB	Restoration Advisory Board
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RfC	reference concentration
RfD	reference dose value
RFD	remote firing device
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	reasonable maximum exposure
rRK	Rock land
RSD	relative standard deviation
RSL	Regional Screening Level
RTI	Research Triangle Institute
S	Sediment
SAP	Sampling and Analysis Plan
SCS	Soil Conservation Service
SI	Site Inspection
SMDP	scientific management decision point
SNR	signal to noise ratio
SOP	standard operating procedure
SRA	Screening Risk Assessment
SS	subsurface soil
SUXOS	Senior UXO Supervisor
TEC	threshold effect concentration
TNT	2,4,6-trinitrotoluene
TRV	toxicity reference value
UF	uncertainty factor
UIC	Underground Injection Control
USAE	USA Environmental, Inc.

USDA	U.S. Department of Agriculture
EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
USMC	U.S. Marine Corp
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO Safety Officer
UXOT I	UXO Technicians I
UXOT II	UXO Technicians II
UXOT III	UXO Technicians III
WpE	Waikane silty clay, 25 to 40 percent slope
WpF	Waikane silty clay, 40 to 70 percent slope
WpF2	Waikane silty clay, 40 to 70 percent slope
WVIA	Waikane Valley Impact Area
WVTA	Waikane Valley Training Area
yd^2	square yard

1.0 Introduction

This report documents the Remedial Investigation (RI) conducted in 2010 at the Munitions Response Site (MRS), also called the Waikane Valley Impact Area (WVIA), located in Waikane Valley, Kaneohe, Oahu, Hawaii (see Figure 1-1). The MRS is undergoing an RI because munitions and explosive of concern (MEC) and surface soil contamination were detected during a previous Site Inspection (SI) at the MRS, as a consequence of past military activities.

Sections 1.1 and 1.2 describe the project background, objectives, and scope of work for the RI. Section 1.3 provides an explanation of the site- and munitions-related terminology. Section 1.4 outlines the organization of this RI Report.

1.1 Project Background

Military activities at the site date back to the early 1940s when the area was used by the Army for jungle training, field maneuvers and a bombing range for air-to-ground ordnance delivery practice. During the 1940s and 1950s, the area was used by the U.S. Army and the U.S. Marine Corps (USMC) for small arms, artillery, and mortar firing. Firing activities apparently stopped in the early 1960s. Surface clearance of ordnance was conducted by the USMC and the Marine Explosive Ordnance Disposal (EOD) Program between 1976 and 1984. The USMC 1976 report concluded that 187 acres of the WVIA can never be certified free of MEC because of vegetation and topography.

An Investigation and Preliminary Range Assessment/Archives Search, and an Engineering Evaluation/Cost Analysis (EE/CA) were conducted in 1998 and 2005-2006, respectively. An SI was conducted in 2008. As a result of clearance and initial investigation activities, a Remedial Investigation and Feasibility Study (RI/FS) was deemed necessary.

The RI/FS project planning meeting was held on April 20, 2009, at the Naval Facilities Engineering Command Pacific (NAVFAC-PAC) Headquarters, Pearl Harbor, Hawaii, to discuss and agree upon project strategies. The meeting was attended by the following representatives:

- USA Environmental, Inc. (USAE)
- Wil Chee Planning
- State of Hawaii Department of Health (HDOH) Office of Hazard Evaluation and Emergency Response (HEER)
- NAVFAC-PAC
- Marine Corps Base Hawaii (MCBH)
- CH2M HILL

The RI/FS project Work Plan (USAE, February 2010) was prepared in accordance with the decisions reached during the project planning meeting, and submitted on February 12, 2010 to the following project stakeholders:

- NAVFAC
- United States Environmental Protection Agency [EPA] Region IX
- HDOH, HEER Office
- National Oceanic and Atmospheric Administration [NOAA]
- United States Department of Interior Fish and Wildlife Service
- Community Restoration Advisory Board [RAB]
- Navy and Marine Corps Public Health Center

This document presents the RI Report, and documents the field investigation activities conducted and the results obtained during the RI portion of the project. A separate feasibility study (FS) will be prepared for the MRS upon approval of the RI.

1.2 Project Objectives and Scope

1.2.1 RI Objectives

The specific objectives of the RI were the following:

- Identify data gaps based on review of available historical information and SI sampling data
- Collect sufficient data to further evaluate the nature and extent of MEC and possible munitions constituents (MC) contamination and refine the conceptual site model (CSM)
- Conduct an Environmental Hazard Evaluation (EHE)
- Identify potential explosive safety hazards associated with MEC remaining at the site
- Characterize potential risks to human health and the environment posed by MC in site media
- Make recommendations for further action or site closure

1.2.2 RI Scope

The following primary tasks were conducted to meet the RI project objectives:

- Surface MEC clearance
- Surface soil, subsurface soil, and sediment sampling for MC

- MEC intrusive investigation
- Geophysical and land surveying
- Laboratory analysis
- Data validation
- Data interpretation
- EHE
- MEC hazard assessment (HA)
- Baseline human and ecological risk assessments
- RI Report preparation

The RI fieldwork was conducted between March and May 2010, in general accordance with methodologies and protocols set forth in the project Work Plan (USAE, February 2010). Field investigation activities focused on five Areas of Concern (AOCs) (see Figure 1-2) that were identified based on the results from the 2008 SI.

1.3 Site- and Munitions-Related Terminology

In some of the historical documents prepared for the site, different site and munitions terminology were at times used, than are being used in this RI Report. All ordnance-related materials now fall in the category of MPPEH until they are subjected to a dual-inspection process, where they may be re-categorized as either material documented as safe (MDAS) or MEC. If the inspected item contains no explosives it is categorized as MDAS. If the item contains explosives it is categorized as MEC, which has three subcategories: UXO, discarded military munitions (DMM), or MC. If initial inspection cannot determine whether the item contains explosives, the item remains categorized as MPPEH until it is explosively treated in the field.

Because reference materials and field reports may still include old terminology, the following list provides a cross reference for the reader's convenience:

Historical Reports	RI Report
MEC scrap and munitions debris (MD)	MDAS
ordnance and explosives (OE)	MEC
unexploded ordnance (UXO)	UXO or MEC
Waikane Valley Training Area (WVTA)	WVIA or MRS

Within this RI Report the terms WVIA and MRS both describe the entire site area and are used as synonyms.

1.4 Report Organization

The RI Report is organized to provide the reader with descriptions of the key elements of the project, including summaries of results and recommendations for future action. Following the introduction provided in Section 1.0, the remainder of the report consists of the following:

- **Section 2.0, Site Setting and Previous Investigation -** Describes the physical setting and history of the WVIA, including historical uses and previous environmental investigations conducted at the MRS.
- **Section 3.0, RI Field Investigation -** Describes the field and laboratory approaches used to conduct the RI and summarizes the main findings of the MEC activities.
- **Section 4.0, Nature and Extent of Contamination -** Describes the nature and extent of contamination at the MRS, based on the RI results, including the approximate distribution of MEC and MC. This section also presents the updated CSM, which represents the current understanding of site characteristics and identifies potentially complete human and ecological exposure pathways associated with the site.
- **Section 5.0, Environmental Hazard Evaluation -** Estimates the environmental hazards associated with the detected contaminated media at the site.
- **Section 6.0, MEC Hazard Assessment -** Identifies potential safety hazards posed by MEC present at the site.
- **Section 7.0, Tier 2 Baseline Risk Assessment -** Estimates the risks due to the detected MC, posed to potential human and ecological receptors at the MRS.
- **Section 8.0, Summary of Findings and Recommendations,** summarizes the results of the RI and makes recommendations regarding the need for further action at the MRS.
- **Section 9.0, References,** lists the references and applicable guidance documents cited in the main text of this RI Report.
- **Figures and tables** referenced in the above sections are presented following Section 9.0.
- **Appendices** included at the end of the report contain supplemental information and data, as follows:
  - **Appendix A, Field Forms,** includes explosive demolition reports, daily reports, and weekly quality control (QC) reports.

- **Appendix B, Photographic Documentation**, with photographs of the main activities conducted at the MRS.
- **Appendix C, Land Survey Data**, contains raw files with coordinates and a map of the grids and other features surveyed at each AOC.
- **Appendix D, Munitions Disposal Documentation**, includes all the documents obtained from the disposal facility once the munitions debris was demilitarized.
- **Appendix E, Digital Geophysical Mapping Results**, provides detailed data obtained from geophysical mapping.
- **Appendix F, Data Quality Assessment Report**, includes the data validation report.
- **Appendix G, Data Listings for Surface Soil and Subsurface Soil**.
- **Appendix H, Kahaluu Land Use Map**, includes the Kahaluu Land Use Map provided in the Koolaupoko Development and Sustainable Communities Plan.
- **Appendix I, Material Safety Data Sheet for Copper.**
- **Appendix J, MEC Hazard Assessment Worksheets**, provides all the worksheets used to estimate the MEC hazards.
- **Appendix K – Baseline Risk Assessment Risk Calculation Data Sheets**, provides all calculation worksheets used to estimate risks to human and ecological receptors at the MRS.
- **Appendix L – Natural Resources Survey,** provides results of a survey of natural resources conducted in advance of the RI fieldwork.

This page is intentionally left blank.

2.0 Site Setting and Previous Investigation

The following sections describe the physical setting and history of the MRS and provide a summary of previous investigations and related findings.

2.1 Site Description and History

The MRS consists of approximately 187 acres located in the Waikane Valley, on Oahu's windward side, approximately 10 miles northwest of Kaneohe Bay (see Figure 1-1). It was once part of a 2,000-acre lease used for military jungle training and field maneuvers. The remaining acreage falls under the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS) and it is not addressed in this RI.

WVIA's military history dates back to the early 1940s, when the U.S. Army leased over 2,000 acres in the Waiahole and Waikane Valleys between 1943 and 1953 for jungle training, small arms, artillery, and mortar firing, field maneuvers and a bombing range for air-to-ground ordnance delivery practice. The area was known as the Waiahole Training Area and managed by the U.S. Army as property of Fort Hase.

In 1953, the USMC leased 1,061 acres of the training area. Training consisted of small arms fire, 3.5-inch rockets, and possibly medium artillery fire. Live fire apparently stopped in the early 1960s. Because of fire hazards, incendiaries were prohibited and all ammunition in excess of 0.50 caliber was to be fired into the designated impact area. The lease was terminated in 1976 and returned to the original owners who farmed and developed it.

In 1944, four people were injured, two fatally, when a 60-millimeter (mm) mortar discovered in Waikane Valley accidentally detonated. Three children were injured in 1963, when a souvenir rifle grenade reportedly discovered in Waikane Valley exploded after it was thrown against a wall. There are no other reports of fatalities or injuries attributable to MEC discovered at Waikane Valley.

The USMC conducted ordnance clearance sweeps in 1976 and 1984. The 1976 clearance effort resulted in the removal of over 24,000 pounds of practice ordnance and fragments, including 42 items of UXO. The after action report stated that 187 acres of the WVIA can never be certified free of UXO because of the ground cover and topography. In December 1983, heavy rain exposed ordnance on the property and Marine EOD removed a number of 3.5-inch rockets. In January 1984, Marines conducted a sweep and removed 480 3.5-inch rockets. In June 1984, an intensive ordnance clearance resulted in the removal of an additional 16,000 pounds of demilitarized practice ordnance and 190 items of UXO from the parcel. The after action report supported the conclusions of the 1976 report that the property could never be certified clear of ordnance.

In 1989, the government acquired title to the 187-acre ordnance contaminated area of the original WVIA. A perimeter chain-link fence was installed in 1992. The area remains as government property because of the unfeasibility of being cleared of all ordnance contamination. The area is currently controlled and maintained by MCBH. The project site is managed as an "other than operational range", with access controlled by MCBH by fencing and warning signs posted in English and Japanese. Civilians may legally enter the property only if accompanied by EOD personnel.

2.2 Climate

The climate of Hawaii is generally temperate, influenced by the Pacific Ocean and the trade winds. There are generally two seasons: a dry season from May through September when the mean temperature is 79 degrees Fahrenheit (°F) and a wet season from October through April when the mean temperature is 73°F.

The average temperature in Waikane varies from 70°F in January-February to 78°F in August-September. Average precipitation ranges between 11 inches of rain in March and 7 inches in June. Average percent humidity varies from 50 percent to 80 percent depending on the time of the day and month (usually higher in early morning during the winter). Average winds range between 9 miles per hour (mph) in January and 13 mph in July.

The project site is located in the interior of the forested Waikane Valley. Like other valleys in the windward side of Oahu, Waikane Valley supports lush vegetation owing to an abundance of water.

2.3 Topography

Waikane Valley is located on windward Oahu approximately 10 miles (16 kilometers) northwest of MCBH. It is one of several valleys with watersheds draining into the northern part of Kaneohe Bay.

Windward Oahu is the remnant of the Koolau Volcano. Waikane Valley was carved into the basalt of the Koolau Range through stream erosion. Some of the gravel and clay formed by weathering and erosion of the volcanic shield were deposited on valley floors. In addition, alluvium of marine origin accumulated in the valleys as the sea level rose during interglacial periods and fell during glacial periods. The project site extends along a steep gradient from 100 feet above mean sea level (amsl) at the southern boundary to approximately 1,400 feet amsl along the northern boundary (see Figure 2-1). Much of the project area has slopes exceeding 45 percent, with some sections containing steep vertical cliffs (Tuggle and Wilcox, October 1998).

2.4 Hydrology

Waikane Stream traverses the project site along its southern border at approximately the 150-foot elevation level. The U.S. Geological Survey (USGS) has monitored stream flow at the 75-foot elevation, approximately 1,150 feet downstream from the eastern border of the property since 1959. USGS records indicate Waikane Stream to be perennial (Belt Collins & Associates, 1990).

Since 1916, the Waiahole Ditch Tunnel System has diverted water for agricultural use at the most productive portion of the Waikane catchment upstream from the site, thereby altering flow volume and other hydrological characteristics of Waikane Stream (Drigot et al., November 2001).

Water quality sampling of Waikane Stream was accomplished in May 2003 at four sampling stations from upstream, to downstream of the MRS. The sampling program measured temperature, pH, conductivity, dissolved oxygen, turbidity, total suspended solids, and nutrients (as ammonia, nitrate plus nitrite, total nitrogen, and total phosphorous). Differences between stations were found to be small and values were within ranges indicating good water quality (AECOS Consultants, September 2003).

Detailed, site-specific information on surface water and groundwater quality is not available because, as specified in the approved Work Plan (see Worksheet 10 of the MC Sampling and Analysis Plan [SAP] - USAE, February 2010), HDOH agreed during the planning meeting of April 20, 2009, that surface water would not need to be sampled and sediment samples are representative of what might be deposited into the stream water and sediments via surface water runoff. It was also agreed that groundwater is not a media of concern at the MRS (see Worksheets 9 and 10 of the MC SAP - USAE, February 2010).

2.5 Geology and Soils

According to the U.S. Department of Agriculture (USDA), Soil Conservation Service (SCS) (USDA SCS, 1972), five soil types are present within the WVIA and exhibit the following characteristics:

- Waikane silty clay, 25 to 40 percent slope (WpE). This soil type is found on steep terraces and alluvial fans. WpE soils are very strongly acid in the surface layer and subsoil, with moderate permeability, medium to rapid runoff, and a moderate to severe erosion hazard.
- Waikane silty clay, 40 to 70 percent slope (WpF). On WpF soil, runoff is rapid to very rapid and the erosion hazard is severe.
- Waikane silty clay, 40 to 70 percent slope (WpF2). This soil type is very similar to WpE except that it is very steep. Most of the surface layer and, in some places, part of the subsoil has eroded. Soft weathered rock is exposed in a few areas. On WpF2 soil, runoff is rapid to very rapid and the erosion hazard is very severe.
- Rock land (rRK). This classification refers to areas where exposed rock covers 25 to 90 percent of the surface. The main characteristics of rRK are rock outcrops (mainly basalt and andesite) and very shallow soils.
- Hanalei silty clay, 0 to 2 percent slope (HnA). This soil type is found on stream bottoms and flood plains. HnA soils are strongly acidic to very strongly acidic in the surface layer and neutral in the subsurface portions, with moderate permeability. On HnA soil, runoff is very slow and the erosion hazard is slight.

Waikane Series soils (WpE, WpF, and WpF2) are found on the majority (approximately 75 percent) of the MRS (Belt Collins & Associates, 1990; Tuggle and Wilcox, October 1998). The WpE soils type is primarily found below the 300-foot contour (Belt Collins & Associates 1990). The top of the ridge at the northern boundary of the MRS comprises rRK, whereas HnA is found at the southeastern corner of the site along Waikane Stream (Belt Collins & Associates, 1990; Tuggle and Wilcox, October 1998).

As agreed by the project team and specified in the approved Work Plan (USAE, February 2010), based on historical data the maximum, investigated depths during the SI and RI activities were limited to 4 feet below ground surface (bgs) (in most cases 0.5 foot bgs) and did not include drilling and soil logging activities. Geology description and analysis at greater depths were not a concern as confirmed by subsurface soil sample analysis that resulted in concentrations below the site-specific EAL and the Koolau volcanic soil background values during the RI. Therefore, no detailed, site-specific lithologic data are available. However, soil types observed during sampling are consistent with the descriptions above, with clayey-silty soil in the lower portions of the MRS and weathered basalt rock (saprolite) at the higher elevations (northern sections of the site).

2.6 Ecology

Literature and field surveys of the WVIA were previously conducted by biologists and environmental specialists (AECOS Consultants, 2003) and resulted in the findings presented below.

Vegetation. The site has been highly disturbed in the past such that only remnants of native vegetation remain. Native plant communities such as *'Ohi'a Scrub* and *Koa/'Uluhe Woodland* occur on some of the ridges that extend to the northern ridge line. The *Ohi'a Scrub* community occurs on the ridges at the north side of the site, and particularly on the eastern end. It is characterized by low and shrubby *'ohi'a* trees with dense clumps of the native fern *pala'a (Sphenomeris chinensis)* between the shrubs. *Koa/'Uluhe Woodland* dominates the northwestern portion of the site on the ridge leading up the hills that separate Waikane Valley from Kaaawa Valley. This plant community comprises *Dicranopteris linearis ('uluhe)*. Two plant communities (such as Managed Land Vegetation and Secondary Forest) found in most of the flat to sloping areas south of the hills on the northern portion of WVIA reflect extensive disturbance. Managed Land Vegetation exhibits the characteristics of abandoned agricultural clearings that cover large patches on the alluvial plain of the Waikane Stream, and the areas around the abandoned living sites. Most of the lowlands of the site are covered by Secondary Forest, which is a plant community almost entirely dominated by alien tree species. The most prevalent of these alien tree species is *Paraserianthes falcataria ("albizia")*, which is a huge, fast-growing tree with an open, spreading canopy. No distinct wetlands were found within the site.

A total of 104 vascular plant species were recorded. Of the 104 species, 17 are native but only five of the native species are endemic to Hawaii: *Cibotium chamissoi (haupu'u 'i'i), Acacia koa (koa), Scaevola gaudichaudiana (naupaka kuahiwi), Metrosideros polymorpha ('ohi'a lehua)*, and *Wikstroemia oahuensis ('akia)*.

Fish and Wildlife. The non-native arthropod, mammalian, and avian species identified at the site are consistent with the habitat. Many common, non-native species are present. Medically important species (such as centipedes, scorpions, widow spiders, western yellow jacket wasps, and common paper wasps) were not observed but may be present. Four mammalian species – domestic dog *(Canis f. familiaris)*, small Indian mongoose *(Herpestes a. auropunctatus)*, domestic cat *(Felis catus)*, and feral pig *(Sus s. scrofa)* – were observed. Fifteen species of birds from 11 separate families were observed. The findings of the avian survey were consistent with the habitat and altitude of the study area. No native avian species were detected. A few native species of aquatic life were found in the middle and lower reaches of Waikane Stream, but were noted as not especially unusual or unique.

Listed Species. Surveys of the site conducted by Char and Associates (1989) and AECOS Consultants (2003) found no federally listed threatened or endangered plant species and no plants proposed for such status. Snail species listed as threatened or endangered under federal or state statutes (i.e., *Achatinella*) were not found (AECOS Consultants, 2003). The endemic Hawaiian sub-species of the Short-eared Owl *(Asio flammeus sandwichensis)* was not detected during surveys but may occasionally use resources present within the site, especially in the more open *'uluhe* dominated higher elevations of the valley wall. The Oahu population of this sub-species is listed as endangered by the State of Hawaii, but it is not listed under federal statues (Department of Land and Natural Resources, 1998; and Federal Register 1999a, 1999b, 2002, 2002). Typical nesting habitat for the threatened Newell's Shearwater *(Puffinus auricularis newelli)* is found on the upper *'uluhe* covered slopes. There are no known nesting colonies of this species on Oahu; however, a small number of these birds are downed annually on the island, most near the lighted entrances to the Pali Highway tunnel (AECOS Consultants, 2003).

2.7 Cultural and Natural Resources

An Environmental Assessment (EA) (MCBH, September 2004) notes that field investigations and ethnographic interviews were conducted in 2003, and a *heiau* or shrine within the National Register of Historic Places was identified and recorded in February 2004 (Magnuson et al., 2004). The project site was divided into three sampling zones based on terrain variations in Waikane Valley. Zone A, along Waikane Stream where archaeological sites had previously been identified, was subjected to a systematic and intensive survey and previously documented sites were recorded again. Zone B, a transition area between the flatter areas near Waikane Stream and the extremely steep slopes along the valley walls, was subjected to a reconnaissance level survey. Zone C, comprising extremely steep slopes along the valley walls, was visually inspected from available vantage points in Zone B and from the ridgeline above. Seven sites were evaluated, several of them within a National Historic Register site. Four were reconfirmed as significant, two were recommended for deletion from state inventory, and one was newly identified as historic. All culturally significant sites appeared to be located in Zone A, less than 0.2 kilometers (220 yards) from Waikane Stream. Archaeological monitoring was conducted during all SI and RI field activities.

2.8 Land Use

The EA report (MCBH, September 2004) indicated that the site has had no modern construction. The property is bounded to the north, south, and west by undeveloped forest lands owned by Kualoa Ranch and SMF Enterprises, Inc. In 1997, the City and County of Honolulu began to acquire lands to the southeast of the project site from Azabu USA Corporation. These lands were then designated as the Waikane Nature Preserve. The Roberts family owns a small parcel adjacent to the southern border of the project site. Non-contiguous coastal lands to the east of the project site include a mix of residential areas, beach parks, and private property.

Approximately 52 acres (less than 28 percent) of the southern portion of the project site were leased for agricultural purposes prior to land acquisition by the federal government. The State of Hawaii land use classification for this leased area was Agriculture. Roughly 17 acres (33 percent) of this leased area was farmed with edible crops. Five vacant living units existed within the leased area. The remaining 135 acres are lands designated by the State of Hawaii Land Use Commission as Conservation and were within the area designated as the Waiahole Forest Reserve.

The Draft EE/CA Report (United States Army Engineering and Support Center, Huntsville, 2006) indicates that the City and County of Honolulu has produced a Master Plan to develop the FUDS portion of WVIA (874 acres) into the Waikane Valley Nature Park. The plan involves establishment of trails, rest and picnic areas, and lookouts to view surrounding landmarks, a ceremonial gathering place (*halau*), re-vegetation areas for native plants, stream ecology study areas, ponds for aquatic wildlife studies, agricultural fields, parking areas, and a visitor orientation area. The majority of the acreage within Waikane Valley consists of inaccessible terrain that cannot be developed because of steep gulches, canyons, rocky outcrops, and mountains rising over 2,200 feet above sea level. However, evidence exists that shows the whole of Waikane Valley has been used, and in all probability will continue to be used, by sportsmen hunting wild boar and other game.

With the exception of some new homes along Haupoa Road and Kamehameha Highway, very little housing development has taken place in Waikane Valley.

2.9 Summary of Previous Investigations

2.9.1 Range Investigation and Preliminary Range Assessment/Archives Search

The MRS was identified for further evaluation as a result of a Range Investigation and Preliminary Range Assessment and Archives Search Report completed in 1998 (MCBH, September 2004). MCBH contracted with the U.S. Army Engineer District, Honolulu to prepare an EA and evaluate the effects of a Proposed Action of conducting non-live fire jungle orientation and maneuver training within the 187-acre property. The Proposed Action was cancelled in September 2004, after the Marine Corps determined that Waikane Valley is unsuitable for troop training because of safety concerns.

2.9.2 Site Investigation

In November 2008, the U.S. Army Corps of Engineers conducted soil, surface water, and sediment sampling at the FUDS portion of WVIA. The Site Investigation Report for Pali Training Camp, Heeia Combat Training Area, and Waikane Training Area, Oahu, Hawaii (Wil Chee Planning, September 2009) indicated that cobalt, mercury, and RDX were detected above the HDOH EAL in two surface water samples collected from Waikane Stream downstream from the WVIA MRS.

2.9.3 Engineering Evaluation/Cost Analysis

From June 2005 to May 2006, the U.S. Army Corps of Engineers conducted fieldwork for an EE/CA, evaluating MEC risks over 874 acres of the FUDS portion of WVIA adjoining the southern and western boundaries of the MRS (United States Army Engineering and Support Center, Huntsville, 2006). The EE/CA included the evaluation for the presence of MEC of 150 grids (each 100 feet by 100 feet) and 9 miles of linear transects. During the investigation, seven MEC items were recovered (two 81-mm high explosive [HE] rounds, three 60-mm HE rounds, and two 37-mm HE projectiles). All of the MEC items were recovered in the southeastern portion of the FUDS site, which adjoins the southern boundary of the MRS. Projectile fragmentation, fuze pieces, tail fins, base plates, and other munitions debris were found throughout the valley.

2.9.4 Site Inspection (SI)

An SI was conducted at the MRS in 2008 (USAE, September 2009). An instrument-aided field reconnaissance survey was conducted to evaluate and document the presence of MEC, MC, or other munitions-related items. The field teams surveyed 9.55 acres in transects and 5.2 acres within 42 cells, for a total of 14.8 surveyed acres (see, Figure 2-2 for Reconnaissance Overview Map). A total of 45 soil samples were collected at the MRS, 35 of which were composite surface soil (0 to 6 inches bgs) samples from the lower elevations and 10 discrete surface soil samples were collected at locations where MEC items had been found. Samples were analyzed for 9 metals, and for explosive constituents (nitroaromatics and nitramines). The analytical results were compared against EPA Region 9 industrial preliminary remediation goals, HDOH Tier 1 Environmental Action Levels (EALs) (HDOH, Summer 2008[1]). Detected metals were also compared to applicable soil background concentrations (Earth Tech, June 2006).

Four surface soil samples exhibited concentrations of copper and lead above the screening criteria. These localized elevated concentrations of copper and lead were believed to be related to the high concentrations of munitions debris observed in AOC-03, one of four main target areas that were subsequently identified as AOCs (see Figure 2-3). The AOC-01 contained small arms munitions and the other three AOCs (AOCs 02 through 04) contained shoulder-fired practice and high-explosive 3.5-inch rockets, 2.36-inch rockets, and rifle grenades. A total of 70 MEC items were found, all fired and fuzed, and therefore considered as UXO (see Figures 2-4 and 2-5). A fifth AOC (AOC-05) was established along Waikane Stream to evaluate sediment/surface water conditions.

[1] The EALs have been updated in March 2009.

Based on the SI findings, copper and lead were identified as constituents of potential concern (COPCs) for all AOCs and were analyzed for during the RI, together with other metals and explosive compounds (see Section 3.2 for additional details).

An Ecological Risk Evaluation was also conducted as part of the SI (Appendix F of the SI Report). This evaluation was conducted in accordance with the methodologies recommended in HDOH, Navy, and EPA guidance and was consistent with the objectives and requirements of Step 3a of Tier 2 (Baseline Ecological Risk Assessment, or BERA) of the Navy's overall tiered process (Navy, 2003). The results of the ecological risk evaluation for avian receptors potentially using habitat at WVIA, as represented by the Hawaiian short-eared owl, indicated that risk to these receptors is *de minimis* and is below the HDOH regulatory limits. However, as further discussed in Sections 5.1.3 and 7.6, because additional data were collected during the 2010 RI, the 2009 ecological risk evaluation was updated and results are provided in Section 7.6 of this report.

This space is intentionally left blank.

3.0 RI Field Investigation

This section summarizes the methodologies that were used to conduct the RI at the MRS in order to meet the project-specific data quality objectives (DQOs) identified in the project Work Plan (USAE, February 2010). The findings of the MEC and MC investigations are provided in Section 4.0.

The RI fieldwork at the MRS was conducted by USAE and subcontractors, between March and May 2010 and included both MEC and MC activities described below. The field management team consisted of a Site Manager, a Senior UXO Supervisor (SUXOS), a UXO Safety Officer (UXOSO), a UXO Quality Control Supervisor (UXOQCS), and an onsite Emergency Medical Technician. Other team members included two UXO Technicians III (UXOT III), five UXO Technicians II (UXOT II), four UXO Technicians I (UXOT I), a Project Geophysicist, and a Site Geophysicist.

Additionally, USAE was supported by the following subcontractors in conducting fieldwork:

- Donaldson Enterprises International (DEI) – Hawaii-licensed Explosive Blaster
- Pacific Consulting Services – Archaeology support
- Wil Chee Planning – MC sampling
- Control Point Surveying – Land surveying
- Pacific Helicopter – Munitions debris extraction

Cumulative time worked in direct support of the fieldwork over a 10-week period was 5,748 man hours. At the beginning of each work day, the Site Manager, SUXOS, and UXOSO held a daily operations and safety briefing at the designated meeting point to discuss work planned for the day, work site assignment to UXO team leaders, ordnance safety procedures and equipment, site-specific hazards and mitigation measures, environmental and archaeological concerns, and coordination of intrusive investigation work with personnel performing non-MEC activities. The field team then mobilized to the worksite, where the UXO team leaders conducted site- and task-specific daily tailgate safety briefings to cover hazards specific to the site, work assignments, procedures, and instrument function test procedures/requirements.

Exclusion zones (EZs) were established at each AOC while intrusive or disposal operations were being conducted. Only essential or authorized personnel were allowed in the EZs during intrusive or disposal activities. Specific training was provided to all individuals accessing working areas.

Daily activities checklists and tailgate safety briefing forms were maintained and filed daily to document that all UXO team members were adequately briefed on daily safety concerns and work assignment. Field forms are included in Appendix A.

Investigation technologies and analytical methods were applied in general accordance with the project Work Plan (USAE, February 2010). Field methodologies are briefly described in

the following subsections; refer to the project Work Plan for additional details.
A photographic log documenting various fieldwork activities is included in Appendix B.

3.1 MEC Activities

Five separate AOCs were identified following the October 2008 SI (USAE, February 2010). These include four target areas (AOC-01 through AOC-04) and the Waikane Stream (AOC-05). As stated in the MEC Sampling and Analysis Plan (SAP)[2], the MEC characterization was focused on AOC-01 through AOC-04 (see Figures 3-1, 3-2, 3-3, and 3-4) and five transects in the southern portion of the MRS, immediately north of AOC-05 (see Figure 3-5). As specified in the Work Plan (USAE, February 2010), all RI activities were limited to accessible areas only. These were defined as the areas with ≤30 degree slopes (estimated at approximately 36 acres, that is, approximately 20 percent of the MRS). Areas with >30 degree slopes were not surveyed/investigated for safety reasons.

The implementation of the MEC investigation was divided into definable features of work (DFW). The tasks required to complete each DFW were identified in the MEC SAP (USAE, February 2010), Worksheets #14, #17, #18, and #21 (and related standard operating procedures [SOPs]). The DFWs for the MEC investigation included the following:

- Certification and Training
- Surface Clearance
- Site Preparation
- Intrusive Operations
- Management and Disposal of MEC and MPPEH
- Site Restoration
- Geophysical Survey
- Geophysical Data Processing and Interpretation
- Quality Control

A brief description and related results for each DFW and associated tasks are provided in the subsections below.

3.1.1 Certification and Training

The field team mobilized to the MRS in March 2010. Upon arrival they inventoried and inspected equipment from the shipment and rented a storage unit. The Site Manager, UXOSO and the SUXOS performed site-specific training to the field team (as specified in Worksheet 8 of the MEC SAP), coordinated communications and other support, and confirmed that all personnel had the proper qualifications and training records. The field team also received briefings on overall project description, site operations, contents of Work Plan, Accident Prevention Plan, Activity Hazard Analysis, and Natural Resources and Cultural Awareness. Additional tailgate meetings were held each morning, at the beginning of the working day.

[2] The MEC SAP is included in Appendix B of the project Work Plan (USAE, February 2010).

3.1.2 Surface Clearance

Prior to beginning limited vegetation clearing and intrusive operations at each AOC, the MEC team performed a systematic surface clearance of 100 percent of the accessible areas using a hand-held analog detector (Schonstedt GA-52Cx magnetometer). As specified in the MEC SAP, surface clearance (like all other RI activities) was limited to areas with slopes of 30 degrees or less (see Figure 1-2).

Hand-held analog detection equipment was used for all MEC surface clearance activities. In order to validate the analog systems (sensors and operators) operability, a geophysical instrument test strip (ITS) was established at a convenient location that simulated field conditions at the AOCs. The test area was used as a function check area for daily certification of analog system operability. The selected location was checked for background anomalies prior to any seed item placement.

The test area was seeded with the following MEC simulants: M9 rifle grenade, 2.36-inch rocket, and 3.5-inch rocket. Three of each seed item type were buried, one shallow to confirm detection, and two deep to establish maximum depth detection capability.

A brief analog ITS performance report was prepared to document the geophysical instrument's ability to detect the seed items. The report included recommendation on the initial, best performing settings for the analog system, allowing the established settings adjusted in the field to reflect the geological conditions across the site.

Two, 5-man MEC teams performed all surface clearance efforts over a 5-week period. Each team was led by one UXOT III who supervised the work procedures of four UXOT II/I. A local archaeologist accompanied each of the MEC teams for the duration of the fieldwork to ensure protection of archaeological features. Prior to commencing operations on each day, the team leader inspected the equipment used for clearance to ensure proper functioning. Before proceeding into the exclusion zone at each AOC, the analog detectors were tested by each team member at the instrument test strip (ITS) (see Figure 1-2) under the observation of the UXOQCS.

All accessible ($\leq$30 degree slopes) areas within each AOC were systematically traversed using analog detectors (Schonstedt GA-52Cx) to locate and mark all potential MEC items encountered. MEC-related scrap that was free of explosives was recovered for later disposal. During work, the teams were organized in line-abreast formations and moved back and forth across the AOC to ensure 100 percent coverage of accessible areas in each AOC. While moving forward, the UXOTs II/I used the hand-held detector to assist them in locating metallic items that were partially buried in the soil and protruding up from the surface, or hidden in vegetation. They proceeded by sweeping the area in small arcs in front of them to identify metallic objects on or partially under the surface. Team members also visually inspected the area between themselves and adjacent team members for signs of potential past ordnance use. Cleared areas were marked using flags. Whenever the team encountered materials identified as potential MEC items, the survey line halted to allow for the UXOT III inspection. If the item was determined to be MDAS, non-MEC related scrap, or MPPEH, the UXOT III directed the UXOT II to recover the material, which was stockpiled with other non-MEC related scrap at the MDAS consolidation points within each AOC (see

Figure 1-2 and Figures 3-1 through 3-4) for later disposal or consolidated with other MPPEH for weekly on-site explosive venting/demilitarization. If the item was identified as UXO and deemed unacceptable to move, the UXOT III marked and recorded characteristics and location of the item in the clearance data and munitions accountability logs, and notified the SUXOS. The SUXOS then coordinated disposal of the item by detonation.

Anomaly data were also recorded on the clearance data and munitions accountability logs. At the end of each day, each UXO team leader checked forms for completeness and turned them over to the Site Manager. After Site Manager inspection, editing and approval, all clearance data and munitions accountability logs, digital photographs, and checklists were submitted to the data manager for entry into the project database, and archiving in the project files on site.

Where MEC was found at the boundary of an AOC, surface clearance extended beyond the boundary to estimate the horizontal extent of munitions in that specific area and better characterize the AOC boundary. In addition, the MEC Team reacquired and disposed of the MEC items discovered during the 2008 SI activities (see Figure 3-6). One of the 2008 MEC items previously noted northeast of AOC-01 was not reacquired; after a thorough instrument-assisted visual survey of the area, it could not be found.

Cleared areas within each AOC are summarized in Table 3-1. All surface clearance results were integrated into the project geographical information system (GIS) database and reported on AOC-specific maps (see Figures 3-1 through 3-4).

A description of MEC and MPPEH items found during surface clearance operations is provided in Table 3-2, while a summary of MEC, MPPEH, and MDAS discovered during surface clearance and intrusive operations at each AOC is provided in Table 3-3.

3.1.3 Site Preparation

After all areas with slopes 30 degrees or less were cleared at each AOC, site preparation activities were conducted to allow intrusive work and subsurface soil sampling. These activities included initial orientation and training, grid layout, and vegetation clearing. Archeological monitoring was conducted during many phases of RI field activities, including site preparation (for example, vegetation clearing) and intrusive work.

3.1.3.1 Boundary and Grid Layout

Before any sub-surface intrusive investigation operations at each AOC, handheld global positioning system (GPS) equipment (Trimble ProXRT with external antenna) was used to establish approximate boundaries of the AOCs (see Figure 1-2). The GPS equipment and tape measures were also used to layout grids and transects for intrusive work (see Figures 3-1 through 3-5).

At the end of intrusive work, a professional-grade survey was conducted by Control Point Survey to determine coordinates of AOC boundaries and establish working grid corners to an accuracy of 0.1 foot (see Appendix C). The location of any MEC encountered within a grid was recorded using handheld global positioning system (GPS) equipment (Trimble ProXRT with external antenna).

3.1.3.2 Vegetation Removal

Vegetation was cleared to within 6 inches of the ground surface within the established AOC boundaries to allow intrusive work and subsequent DGM surveys. Cutting was limited to brush, vines, and tree limbs to allow movement of the detection equipment. Vegetation was cut into approximately 2-foot lengths or mulched and spread over the cut area to mitigate runoff. At down-slope boundaries, vegetation was left undisturbed as much as possible so that a vegetative buffer strip was left in place to control sediments.

3.1.3.3 Archeological Monitoring

Pacific Consulting Services conducted archeological monitoring during many phases of RI field activities. Field methods for archaeological monitoring during the RI activities varied with the types of activities being monitored. Two archaeologists accompanied the USAE teams at all times in order to monitor vegetation clearing and all ground disturbing activities. The RI activities monitored by the archaeologists included vegetation clearing, surface clearance sweeps, subsurface clearance, demolition operations, blow-in-place activities, soil sampling, Digital Geophysical Mapping (DGM), and helicopter operations (transporting MDAS out of the MRS via helicopter).

3.1.4 Intrusive Operations

Subsurface intrusive activities were conducted between April 19, 2010 and May 4, 2010, to evaluate the density and vertical extent of MEC within the five AOCs. Intrusive work consisted of investigation of anomalies detected with the analog detectors during surface clearance operations.

A total of 25 grids were established within the cleared areas of AOC-01 through AOC-04 (see Figures 3-1 through 3-4). The grids were approximately 1/16 acre in area and were established based on surface clearance results, as follows: two grids were located at the densest occurrence of surface MEC within each AOC, while the remaining grids were spread out across each AOC to characterize moderate and low density areas. Excavations in each grid were conducted down to a maximum depth of 4 feet bgs. Additionally, subsurface intrusive work (and DGM) were conducted at five transects established along AOC-05 (see Figure 3-5). These transects were approximately 3.3 feet wide and had different lengths, as follows:

- Transect #1: 41 feet
- Transect #2: 65 feet
- Transect #3: 40.5 feet
- Transect #4: 37 feet
- Transect #5: 78 feet

Subsurface investigation was accomplished using two, 5-man UXO teams, each consisting of a UXOT III and four UXOT II/I. Each grid was subdivided into 5-foot wide individual search lanes to facilitate control of the clearance and to ensure complete coverage of each grid. Before beginning intrusive operations, the field archaeologist conducted a visual inspection of the grid to determine if there were any archaeological features to be avoided.

A UXOT II was assigned to each search lane to systematically search the lane using a hand-held analog detector (Schonstedt GA52Cx magnetometer). The technicians moved forward, sweeping the instrument back and forth across each lane in a manner that kept the tip of the instrument within 4 to 6 inches of the ground surface and forming a series of arcs across the lane with no greater than 3 to 4 inches between arcs. The UXO technicians excavated and identified the source of each anomaly as it was encountered.

Throughout the survey the UXOT III closely monitored the work of the UXOTs II/I, recorded location data for the subsurface anomalies and the results of any investigation performed. Separate records were prepared and maintained for each individual work grid and are reported in Appendix A.

Before beginning intrusive operations, the UXOQCS emplaced blind seed items (BSIs) within each investigation grid and in the transect along the northern boundary of AOC-05 (also see Section 3.1.5 below). The BSI density was one to two per grid and one every approximately 100-foot segment of the 4-foot wide transect. The UXOQCS recorded the GPS location (see Figures 3-1 through 3-5) and depth of each BSI and restored the emplacement site so not to be obvious to the clearance team. All BSI were recovered during intrusive operations.

When a subsurface anomaly or metallic surface object was encountered, the UXOT immediately conducted a subsurface investigation of the object. The specific intrusive investigation procedures were as follows:

- An appropriate EZ was set up for intrusive operations.
- Each anomaly was investigated by locating the boundaries and excavating gently to one side of the target. A shovel was used to excavate to within 12 inches of the anomaly. The final 12 inches of soil were removed using a small trowel or gloved hand.
- If the anomaly was determined to be MEC, the item was marked and the SUXOS notified to determine disposition of the item.
- If the item was determined to be MEC and unacceptable to move, it was left in place and barricaded until it could be safely detonated in place.
- If the munitions item was judged to be safe for transport, it was consolidated with other MPPEH/MDAS within the AOC for later venting/disposal.
- Once an anomaly was removed, the UXOT III inspected the excavation both visually and with the all-metals locator to confirm that all anomalies present within the dig depth were removed. The archaeologist then inspected the excavation visually to determine if any cultural feature was discovered or disturbed.
- Upon completion of the excavation and the required QC checks, the excavation was backfilled and the data on anomalies/MEC/MPPEH/MDAS (including GPS

coordinates) found within the specific grid were reported in the clearance data and munitions accountability log.

The UXOT III informed the Site Manager when intrusive activities were completed. Findings of intrusive operations within each AOC are summarized in Table 3-4. One MEC item (M28 rifle grenade) was found in grid 6 within AOC-04 and one MPPEH item (2.36-inch rocket motor) was found in grid 4 within AOC-03, both at a depth of 1 foot bgs.

Findings of intrusive operations conducted within AOC5-transects area located south of AOC-02, AOC- 03, and AOC- 04 are summarized in Table 3-5. No MEC or MDAS were found along these transects.

3.1.5 MEC/MPPEH Management and Disposal

All MEC and MPPEH items located during surface clearance and sub-surface intrusive investigation operations were vented/demilitarized by countercharging the munitions with a commercial explosive donor charge and detonating the donor charge. All explosive disposal operations were performed under the direct supervision of the SUXOS and the UXOSO, in accordance with the SOP-6 of the MEC SAP.

Before any detonation activity was initiated, all technicians assigned to or working with disposal teams attended a site-specific orientation to review MEC disposal and emergency response procedures. The topics discussed during the orientation included the specific health and safety plan, demolition SOP, explosive transportation, site ordnance briefing, engineering controls (protective measures for cultural features), characteristics of MEC, emergency procedures, and team assignments.

Prior to the initiation of any explosive charge, the SUXOS confirmed that all required coordination had been made with local agencies and the fire department, and that the area within the EZ was clear. DEI provided explosives delivery and blasting services, employing personnel with the necessary Hawaii Blaster's Permit.

MEC items discovered during each workweek were marked or consolidated as appropriate for a demolition event to occur at the end of each week. Based on field inspections, the MEC items that had been fired and were determined to be still fuzed were blown in place (BIP). Sandbags were placed around the MEC items if necessary to prevent fragmentation from reaching archaeological features. MEC items determined acceptable to move were moved to a different location and consolidated with other MEC and MPPEH items for detonation (see consolidation points in Figures 1-2 and 3-1 through 3-4) within each AOC.

Preparation, initiation, and post-demolition sequences and procedures were followed as described in SOP-6 of the MEC SAP. Remote firing devices (RFDs) with electric blasting caps as an initiator were used for the detonations. An inspection of the disposal site and surrounding area was conducted after each disposal operation. All munitions debris was then picked up and containerized for off-site disposal with other debris as described below.

Fifteen demolition shots were conducted and generated a total of 1,085 pounds of munitions debris as summarized in Table 3-6 and detailed in the explosive disposal logs (see Appendix A).

All MDAS found during surface clearance, and all the MDAS generated during explosive demolition operations was inspected (in accordance with SOP-7 of the MEC SAP) and recovered to consolidation points within each AOC (see Figure 1-2 and Figures 3-1 through 3-4) for disposal.

The MDAS was extracted and transported via helicopter from each consolidation point to the processing area that was set up approximately one mile from the entrance gate to Waikane Valley, off the Waikane Valley road (see Figure 1-2). Extraction and transport operations to the processing area were conducted on May 5 and May 6, 2010 by Pacific Helicopter.

On each day, before starting extraction operations, the Pacific Helicopter pilot and the USAE SUXOS, UXOSO, and team leaders discussed how the operation would be conducted, including radio and emergency procedures. The discussion was followed by a tailgate safety briefing for all personnel. Five extraction lifts were conducted on May 5, removing an estimated 4,000 pounds of MDAS. Seven extraction lifts were conducted on May 6, removing the remaining MDAS (estimated at approximately 4,200 pounds)[3].

Upon arrival at the processing area, the SUXOS and UXOQC inspected all MDAS which was then containerized in 55-gallon drums for off-site transport. The drum covers were attached, lead seals placed over the drum cover clamp ring, and seal serial numbers logged by both the SUXOS and UXOQC. All drums were properly labeled (DoD Form 1348-1). A total of 15 drums were transported on a stacking truck to a temporary storage unit. On May 11, 2010, the 15 drums were palletized, transferred to the Honolulu Airport FEDEX Freight office, and shipped to a disposal facility in California, where they were confirmed demilitarized and smelted in accordance with guidelines provided in DoD 4160.20-M-1 (see Certificate of Destruction in Appendix D). A total of 8,080 pounds of MDAS was disposed of at the authorized facility Timberline Environmental Services, in Cold Springs, California.

3.1.6 Site Restoration

Following intrusive sampling each day, pin flags, signs, and barricades were removed. After the inspection by the site archaeologist, the excavated areas were then backfilled using native soil from the excavation. The non-munitions scrap retrieved from the target areas was disposed of at local scrap dealers or landfills.

3.1.7 Geophysical Survey

Following intrusive investigation of each grid and transect, DGM was performed to provide a geophysical map of any anomalies remaining within the intrusive areas. USAE also performed DGM at portions of the MRS to evaluate the applicability of this technology at the MRS. DGM data acquisition was conducted in general accordance with SOP-2 and SOP-3 of the MEC SAP. Activities and results are briefly summarized below, and DGM details are provided in Appendix E.

---

3 Quantities are reported as described and estimated in the daily operation summary reports. The total quantity of 8,080 pounds was then weighed on commercial scales at the disposal facility upon arrival. The difference is because quantities were estimated in the field.

An EM61-MK2A was deployed in stretcher mode, positioned with traditional line/station/fiducials. Fiducials were established every 25 feet. Grid corner locations or transect start and end locations, provided by the project professional land surveyor, were used to translate the data into geodetic coordinates.

The DGM ITS was surveyed on Tuesday, 27 April 2010, after seeding the ITS centerline with two small Industry Standard Objects (ISOs) seeds. These consisted of 1-inch diameter by 4-inch length pipe nipples. The ITS was surveyed with three overlapping lines (-2.5 feet, 0 feet, and +2.5 feet) and an offset line to collect dynamic background data. The ITS data were processed and analyzed on-site to establish anomaly selection criteria. An anomaly selection threshold of 6.25 millivolts (mV) was based on five times the background noise value of 1.2 mV. The signal to noise ratio (SNR) statistics were calculated, using a window size of 4, which resulted in a final anomaly selection based on a SNR > 6.25 mV and a Signal Strength > 5000 mV.

The DGM team, escorted by the UXOQCS, mobilized the DGM system to AOC-02, AOC-03, and AOC-04. The accessible portions of grids were set up; including 25-foot fiducials, survey lines marked every 2.5 feet, control seed items placed by the project geophysicist, and blind seed items placed by the UXOQCS.

The following grids (or portions of them) were surveyed (see Section 3.1.3 for further details):

- **AOC-02**, Grid 5 and Grid 6 on Monday, 3 May 2010.
- **AOC-03**, part of Grid 6 and part of Grid 7 on Wednesday, 28 April 2010, and part of Grid 8 on Thursday, 29 April 2010.
- **AOC-04**, Part of Grid 2 on Tuesday, 27 April 2010, part of Grid 6 on Wednesday, 28 April 2010.
- **AOC-05**, five transects (#1 through #5) on Monday, 3 May 2010.

3.1.8 Geophysical Data Processing and Interpretation

The purpose of the DGM task was to provide a subsurface anomaly map of the grids and transects that had been previously cleared and quality controlled by analog detection methods, and to confirm the suitability of DGM in relation to the geology and terrain of this site. The DGM effort was not used as a QC measure. Therefore, geophysical data processing and interpretation was limited to that necessary to:

- Demonstrate that the grid or transect was mapped (site coverage).
- Demonstrate that static and dynamic performance metrics established at the ITS were maintained
- Confirm the detection and positional accuracy of the EM61-MK2 in identifying and locating standardized test items by comparing against measured distances and repeatable anomaly characteristics.

- Interpret any remaining anomalies, following the anomaly selection criteria established at the ITS.

All survey data were inspected, reviewed, processed, and analyzed by the Site Geophysicist in accordance with SOP-3 (Geophysical Data Processing & Interpretation) and as demonstrated at the ITS. Sensor manufacture software and Geosoft's Oasis Montaj were used to process and analyze the geophysical data.

All datasets were converted from the line/station/fiducial local coordinates into the project coordinate system, evaluated and corrected for positional latency and leveled as required. Data were then gridded, contoured and displayed on a map for target selection. Targets were selected from these maps initially by running the data through Geosoft's UX-Detect package. Each of the anomalies selected by Geosoft as a target was analyzed by the Site Geophysicist, and evaluated as to their validity and position.

DGM maps for each AOC grid or transects were reported/uploaded and integrated into the project GIS database for final reporting (see Appendix E). DGM performance metrics from daily static and dynamic checks and production data were reported to document the proper DGM system performance and to document the utility of DGM at this project site.

Several anomalies were detected in AOC-03 to AOC-05 and consisted of control and blind seeds, DGM anomalies, professional land surveyor hub nails, and a known MDAS object. Overall DGM investigation results indicated that this technology and equipment is not well-suited for the WVIA because of steep and slippery slopes, and dense vegetation that make the use of EM61-MK2A equipment logistically challenging, impractical, and unsafe. For the WVIA site, analog geophysics (using a magnetometer, which easily hand-carried) is a better technology because operators can more easily gain access to the site, vegetation removal is minimized, and site coverage is more complete.

3.1.9 Quality Control

Data quality during fieldwork operations was maximized through daily meetings, inspections, and equipment calibration/testing. USAE control process included five steps to maximize data quality. All steps were followed as detailed in worksheets 34, 35, and 36 of the Work Plan (USAE, February 2010). This quality step process is briefly summarized below.

Step I included verification of training, personnel qualifications, construction of the ITS and ITS certification testing of all geophysical and UXO teams and equipment, grid layout and vegetation removal. Surveillance checks ensured the completion and documentation of mandatory pre-operational preparation. Preparatory and inspection checklists were also used to document training, personnel qualifications, equipment status, and each inspection conducted for each DFW. Geophysical and UXO field teams were tested through the ITS prior to commencing actual field operations and an ITS certification form field checklists completed to document geophysical and UXO team members by name, search equipment serial numbers, and ITS score (see Appendix A).

Step II documented that the DFWs were completed in accordance with the contract specifications and project Work Plan. Initial and follow-up phase checklists (see

Appendix A) were used to document that all aspects of the RI were completed in accordance with the applicable procedures.

Step III included independent verification of DGM processing and interpretation of the geophysical data collected by the project geophysical teams at each grid (25 grids and one transect). An independent verification team generated an anomaly list that was compared to the anomaly list of the production team to evaluate processing techniques. This effort started during ITS testing and continued throughout the duration of the project to maximize consistency, increasing performance standards of the geophysical investigation.

Step IV documented that the UXO teams properly conducted MEC clearance operations in accordance with the approved procedures. Specific follow-up checklists, along with appropriate QC surveillance forms, were compiled and are reported in Appendix A.

Step V entailed QC activities performed at each grid to maximize the effectiveness of the MEC removal. These activities included the emplacement of BSI within each grid/transect and additional inspections of cleared grids. Standardized test items (such as standard pipe nipples) were used as BSI to ensure dynamic detection and repeatability during the DGM survey. The DGM team recorded the precise location, depth, and orientation of each seed item in a test item tracking log and verified the ability to locate the seed with the detection equipment used for DGM. Additionally, after each grid was completed, the UXOQCS randomly selected 15 percent of each sample grid and checked the selected areas for any remaining anomalous features. No anomalies were detected during the QC inspections.

3.2 MC Activities

The MC characterization included the collection and analyses of soil and sediment samples to: 1) evaluate the nature and extent of contamination at the site; 2) collect adequate data to assess potential hazards and risks to human health and the environment derived from MCs at the site. To meet these objectives, the following activities were conducted at the site:

- Surface soil sampling using a multi-increment (MI) approach
- Surface soil discrete sampling at BIP locations
- Subsurface soil discrete sampling (including background soil sampling)
- Sediment composite sampling
- Quality assurance/quality control (QA/QC) sampling
- Equipment decontamination
- Sample management and analysis

As stated in the MC SAP[4], sampling activities were conducted at the five target AOCs. Soil sampling was focused on AOC-01 through AOC-04, where numerous MDAS, MPPEH, and MEC items were found during surface clearance and intrusive operations. Sediment sampling was conducted in AOC-05 (Waikane Stream). As discussed below, the sample analytical program was developed based on the 2008 SI findings and agreed/approved during the planning meeting of April 20, 2009. A specific analytical plan for surface soil

[4] The MC SAP is included in Appendix B of the project Work Plan (USAE, February 2010).

discrete samples at BIP locations was developed to assess the potential impact from blow in place activities and it was not related to the 2008 SI results.

For surface soil sampling purposes, AOCs 01 through 04 were subdivided in different decision units (DUs), as follows:

- **AOC-01** – DU-1.
- **AOC-02** – DU-2 (north), DU-3 (center), and DU-4 (south)
- **AOC-03** – DU-5 (north), DU-6 (center), and DU-7 (south)
- **AOC-04** – DU-8 (north), DU-9 (center), and DU-10 (south)

Additionally, AOC-05 was subdivided in three DUs (upstream, midstream, and downstream) to evaluate MC distribution along the stream. Sample locations in each DU/stream section were selected based on historical data and conditions found in the field during fieldwork activities. Among these, the 30 degrees slope limitation (that is, areas with slopes greater than 30 degrees were considered inaccessible – see Figures 1-2 and 3-1 through 3-5), surface clearance, vegetation, and cultural features were critical factors and guided selection of sample locations.

Sampling operations were conducted in general accordance with the MC SAP. Results are summarized in Section 4.0, where the nature and extent of contamination is discussed.

3.2.1 Surface Soil Sampling Using a Multi-Increment Approach

To evaluate the nature and extent of potential metal contamination in surface soil at the site, the MI sampling approach was used to maximize sample representativeness. The MI sampling focused on the shallow surface soil (0 to 0.5 foot bgs), to which human receptors are most likely to be exposed, within AOCs 01 through 04. MI sampling was conducted on 19 and 20 April 2010.

In accordance with the MC SAP, AOC-02, AOC-03, and AOC-04 were each subdivided into three DUs, while AOC-01 consisted of one DU (see Figure 3-7). Each decision unit was subdivided into 30 grids from where one soil increment was collected and combined to form the MI primary sample. Because of the 30 degree slope limitation and the presence of vegetation, the grid boundaries were adjusted to field conditions and resulted in irregular shapes.

The rationale for selecting the ten DUs was based on existing knowledge of known or suspected MEC and MC contamination, as well as areas topographically downslope from potential source areas, where MC may have migrated. These decision units adequately cover the 4 suspected munitions target locations (AOC-01 to AOC-04) that were identified during the 2008 SI. Detailed specific rationale for selecting the 10 DUs is discussed in Worksheet #17 of the MC SAP.

MI sample increments were collected at the surface or near the surface (0 to 0.5 foot bgs) at all decision units. Vegetative matter, rocks, or pebbles were removed from sample increments, unless they were part of the overall soil matrix. The soil increments collected for each MI sample were placed in the corresponding 1-gallon Ziploc™ bag, labeled, and placed in a cooler. MI samples were analyzed for the COPCs identified during the 2008 SI (copper and lead) using EPA analytical method SW6010B.

To evaluate the data variability and determine whether an estimate of average contaminant concentrations is adequately representative of the sampling area, duplicate and triplicate samples were also collected from each DU (for a total of three MI samples per DU and 30 samples for the entire MRS).

As reported in Table 3-7, MI sample IDs included an eight-digit code, with the first four digits (WVIA) indicating the site (Waikane Valley Impact Area), the fifth digit (M) specifying the type of sample (multi-increment), and the final three digits indicating the sample number. Duplicate and triplicate samples were labeled with subsequent numbers after the primary sample.

3.2.2 Surface Soil Discrete Sampling at BIP Locations

Surface soil samples were collected at 10 BIP locations (see Figure 3-8) to evaluate the impact associated with MEC venting operations. One discrete soil sample was collected at each BIP location from 0 to 0.5 foot bgs before, and after, venting operations.

A total of 20 BIP surface soil samples were collected at the site using 4-ounce disposable plastic spoons. The soil was placed into an 8-ounce glass jar, packed in coolers with ice, and shipped to the laboratory. The analytical program was agreed upon during the planning meeting of April 20, 2009 specifically to assess the potential impact from blow in place operations and it was not related to the SI results. Samples were analyzed for moisture (using EPA analytical method SWD2216), metals (EPA method SW6010 B), and the explosive compounds nitroaromatics and nitroamines (EPA method SW8330B).

As reported in Table 3-7, surface soil BIP sample IDs included a nine-digit code, with the first four digits (WVIA) indicating the site (Waikane Valley Impact Area), the fifth digit (B) specifying the type of sample (BIP soil), three digits indicating the sample number, and the final digit specifying if the sample was taken pre (A) or post (B) BIP operations. Field duplicate samples (WVIA-B-007A and WVIA-B-012B, duplicates of WVIA-B-006A and WVIA-B-011B, respectively) were labeled with subsequent numbers after the parent sample.

3.2.3 Subsurface Soil Discrete Sampling

Subsurface soil samples were collected at ten locations within AOC-01 through AOC-04 (see Figure 3-9) on 26 April 2010 and 27 April 2010, to characterize the lateral and vertical extent of copper and lead contamination within each AOC. Two discrete samples were collected at each location from depths of 2 and 3 feet bgs. As specified in the MC SAP, the maximum sampling depth of 3 feet was selected by the project team based on the following:

- Penetration depth of the munitions (expected to be 2 feet bgs) estimated during the 2008 SI
- Windward Oahu rains being typically low in acids or other chemicals that would enhance solution and therefore vertical migration of metals
- Erosion process exposing MEC at shallow depths

A total of 20 subsurface soil samples were collected at the site using a hand auger placed into a 16-ounce glass jar, packed in coolers with ice, and shipped to the laboratory for analysis. The analytical plan agreed during the planning meeting of April 20, 2009, was developed based on the 2008 SI results, conservatively extending the analyses to the full suite of metals (using analytical methods EPA methods SW6010 B and SW7470A).

As reported in Table 3-7, subsurface soil sample IDs included a nine-digit code, with the first four digits (WVIA) indicating the site (Waikane Valley Impact Area), the fifth and sixth digits (SS) specifying the type of sample (subsurface soil), and the final three digits indicating the sample number. Field duplicate samples (WVIA-SS-013 and WVIA-SS-024, duplicates of WVIA-SS-012 and WVIA-SS-023, respectively) were labeled with subsequent numbers after the parent sample.

Additionally, two background subsurface soil samples were collected at 2 feet bgs (WVIA-SS-019, in the vicinity of the gate located next to the residential homes off of Waikane Valley Road) and between 0 and 0.5 foot bgs (WVIA-SS-026, north of AOC-04)[5]. These samples were collected to assist with evaluation of site-specific background concentrations for metals data evaluation. As further discussed in Section 4.0, background concentrations for metals in Koolau volcanic soil at Oahu Navy Facilities (Earth Tech, June 2006) were also considered in data evaluation to have a larger and more statistically representative population.

3.2.4 Sediment Composite Sampling

Sediment sampling was conducted on 13 April 2010 at AOC-05 (Waikane Stream). Three adjacent DUs/sections were identified within the stream based on topography as representative of downstream (sample WVIA-S-001), midstream (sample WVIA-S-002), and upstream (samples WVIA-S-003 and WVIA-S-005) DUs/locations (see Figure 3-10). Composite stream sediment samples were taken from each DU/section and consisted of 30 sub-samples collected between 0 and 0.5 foot below the stream bed at approximately equally-spaced intervals.

An attempt was made to collect sediment samples using the AMS hand auger system with a sediment attachment at the bottom. This attempt was unsuccessful because of the coarse sediments present in the stream bed. Disposable, 4-ounce plastic scoops were therefore used to collect the sediment samples.

Sub-samples were temporarily placed in a 1-gallon Ziploc™ bag. Once all sub-samples were collected, the soil was placed in an aluminum foil-lined, 5-quart stainless steel bowl, homogenized, and then containerized in an 8-ounce glass jar. After sampling operations were completed at each section, disposable plastic scoops, aluminum foil, and nitrile gloves were temporarily stored in plastic trash bags for later disposal at the municipal landfill.

A total of five composite sediment samples (including one field duplicate, WVIA-S-004) were collected at the site and sent to laboratory where they were analyzed for moisture (EPA method D2216), metals (EPA methods SW6010B and SW7470A), and the explosive

5 Although background sample WVIA-SS-026 was collected inside the WVIA site, the location was at an elevation (approximately 800 feet amsl) where there was no indication of MEC presence in the area.

compound hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) (EPA method SW8330B). The analytical program was agreed upon during the planning meeting of April 20, 2009, and included copper and lead, identified as COPCs during the 2008 SI. Additional COPCs (cobalt, mercury, and RDX) were identified during the review process of the draft RI Work Plan, during which the Site Investigation report for the Pali, Heeia, and Waikane areas by the Army Corps of Engineers became available. The Site Investigation Report for the Pali, Heeia, and Waikane areas indicated that cobalt, mercury, and RDX were detected above the HDOH EAL in two surface water samples collected from the Waikane Stream downstream of the WVIA MRS (Wil Chee Planning, September 2009). Based on the surface water findings, it was agreed by the project team to analyze the sediment samples for these COPCs.

As reported in Table 3-7, sediment sample IDs included an eight-digit code, with the first four digits (WVIA) indicating the site (Waikane Valley Impact Area), the fifth digit (S) specifying the type of sample (sediment), and three final digits indicating sample number.

3.2.5 Quality Assurance/Quality Control Sampling

Sampling activities included the collection of field QA/QC samples to evaluate potential bias due to sample matrix (matrix spike/matrix spike duplicate [MS/MSD] samples) and assess the precision of the entire data collection activity (field duplicate [FD] samples), including sampling, analysis, and site heterogeneity.

The following QA/QC samples were associated to the four types of sampling activities collected at the site:

- Surface soil MI sampling
  - Duplicate and triplicate samples were collected in each DU covered by MI sampling. As described in Section 3.2.1 and further discussed in Section 4.2.1, a set of three samples was collected at each DU to evaluate sampling accuracy and soil heterogeneity.
- Surface soil BIP samples
  - Two FDs: WVIA-B-007A (duplicate of WVIA-B-006A) and WVIA-B-012B (duplicate of WVIA-B-013B)
  - One MS/MSD: WVIA-B-012B
- Subsurface soil samples
  - Two FDs: WVIA-SS-013 (duplicate of WVIA-SS-012) and WVIA-SS-024 (duplicate WVIA-SS-023)
  - One MS/MSD: WVIA-SS-018
- Sediment samples
  - One field duplicate: WVIA-S-004 (duplicate of WVIA-S-003)

– One MS/MSD: WVIA-S-005

The FD and MS/MSD samples were handled in the same way and analyzed for the same parameters as their parent samples. Additionally an equipment blank sample was collected to evaluate cross contamination phenomena potentially associated with decontamination activities. This sample consisted of analyte-free water that was poured through the AMS hand auger after the decontamination rinse and collected for laboratory analysis. The equipment blank was collected on 27 April 2010, after the last subsurface soil sample, and labeled WVIA-SS-025. This sample was analyzed for copper and lead (same analytical plan as subsurface soil samples).

3.2.6 Equipment Decontamination

The AMS hand auger used for collection of subsurface soil samples was decontaminated after operations were completed at each sampling location to minimize the potential for cross contamination between subsequent sampling points, therefore increasing sample representativeness. Decontamination procedures consisted of a first wash using a solution of potable water and phosphate-free detergent. A scrub was used to help removing dirt from the sampling tool. The auger was then rinsed with de-ionized water and air dried.

Equipment used to collect surface soil, BIP, and sediment samples consisted of plastic, dedicated spoons, which were disposed of after use at each sample location. Plastic spoons were temporarily stored in a trash bag and then disposed of as municipal waste at the end of each day.

3.2.7 Surveying

The point coordinates (easting and northing) of the discrete (subsurface and BIP) soil sampling locations were surveyed by USAE personnel using a hand-held Trimble ProXRT GPS unit with an external antenna. Coordinate data were collected in meters using the UTM WGS84 Zone 4 North coordinate system and post-processed to ensure the best achievable accuracy. Multi-increment locations for surface soil and sediment composite samples were not surveyed because samples are representative of large areas (DUs).

3.2.8 Laboratory Methodologies

Laboratory analysis of samples collected at the site was conducted by Curtis and Tompkins Ltd. Laboratories, located in Berkley, California. The analytical plan is provided in Table 3-7 and was performed in accordance with the MC SAP.

3.2.9 Data Validation Data Quality Assessment Summary

The data validation and quality assessment of the analytical data was conducted by Laboratory Data Consultants, Inc. As reported in the Data Quality Assessment Report included in Appendix F of this RI Report, a total of 685 analytical data were evaluated and none were rejected.

Precision and accuracy were evaluated using data quality indicators (for example, calibration, surrogates, MS/MSD, and laboratory control samples). Also, field and laboratory control samples were collected and holding times, sample handling, and analytical SOPs were applied in compliance with the project Work Plan to evaluate representativeness and comparability of results.

Results obtained during laboratory analyses are considered of acceptable quality to meet the project objectives.

This space is intentionally left blank.

This page is intentionally left blank.

4.0 Nature and Extent of Contamination

The nature and extent of contamination in site media at the MRS was evaluated using MEC and analytical data obtained during the 2008 SI and the 2010 RI. The approximate distribution and extent of MEC is summarized in Section 4.1. Nature and extent of MC is discussed in Section 4.2.

4.1 Distribution and Extent of MEC

This section describes the approximate distribution and extent of MEC, MPPEH, and MDAS (see Section 1.3 for details on terminology) at the MRS, based on 2008 SI and 2010 RI findings. The following assumptions/limitations apply to the MEC assessment:

- Out of the approximately 187 acres of the MRS, approximately 151 acres (about 80 percent) have slopes greater than 30 degrees and were not surveyed.
- The 2008 SI surveys covered an area of approximately 14.8 acres.
- The 2010 RI surface clearance activities covered four target AOCs, partially overlapping the area surveyed in 2008. The areal extent of the target AOCs was approximately 24 acres (about 13 percent of the total MRS area), of which about 11 acres were surface cleared (the remaining 13 acres were not accessible because of slopes greater than 30 degrees). Additionally, approximately 0.8 acres of the 11 cleared acres were intrusively investigated.
- Distribution and extent of MEC/MPPEH/MDAS at the site can vary over time and is affected by erosion (at least partially controlled by rainfall and wind) and vegetation that can influence migration downslope (slopes at MRS are generally very steep).
- Most of the 187 acres of the MRS could not be certified free of UXO because of the dense ground cover, vegetation, and extremely steep topography. Although cleared areas were free of UXO at the surface at the time of the RI fieldwork, factors specified above could alter MEC/MPPEH/MDAS distribution at the site in the future.

Distribution and extent of MEC/MPPEH/MDAS can be summarized as follows:

- Significant evidence of MEC was discovered on the ground surface during the 2008 SI when visual evidence of MDAS appeared in similar distribution to the MEC (see Figures 2-4 and 2-5). A total of 70 MEC items were found, 69 of which were recovered during the 2010 RI activities (the missing item was not found at the surveyed location and is suspected to have migrated downslope because of erosion). MEC items appeared to be concentrated in what were later (2010 RI) identified as AOC-02 and AOC-03.
- Significant evidence of MEC (21 items) and MPPEH (92 items) was observed during the 2010 RI (see Figures 3-1 through 3-4). Items were mainly concentrated in an area extending over approximately 40 acres, across AOC-02, AOC-03, and

AOC-04 (see Figure 4-1). No MEC, MPPEH, or MDAS were found within AOC-01, except for expended small arms projectiles found immediately east of the AOC (Figure 3-1).

- The areas where MEC/MPPEH were found are generally characterized by steep slopes, erosion, and various degrees of vegetation densities. Firing of munitions at the target areas caused severe erosion and subsequent stormwater runoff may have caused limited migration of MEC from the upper elevations to lower locations. However, there is no evidence that MEC has washed down to Waikane Stream. The entire length of the stream within the site boundaries was observed by UXO Technicians during collection of composite sediment stream samples. No evidence of MEC was observed within, or near the stream.
- All accessible areas south of AOC-02, AOC-03, and AOC-04 were surveyed during the SI and RI fieldwork. A total of 2.92 acres in transects and grids were surveyed with all-metals detectors in this area during the SI and RI combined (Figure 4-1). Additional undocumented acres were inspected by UXO personnel during the RI fieldwork while traversing through this area. No MEC, MPPEH, or MDAS were found south of Waikane Stream (see Figure 4-1) or south of the division line shown in Figure 8-1 during the RI daily activities, such as: trenching operations, composite sediment sampling of the entire length of the Waikane Stream within the MRS, field teams ingress and egress from target AOCs on a daily basis, or while the QC technicians walked through the entire site determining locations of slopes 30 degrees or less.
- Items 3, 16, and 17, found south of Waikane Stream during the SI (see Figure 2-5) and removed during the RI, are assumed to have been carried out from the north side of the stream by trespassers. Items 3 and 16, 3.5-inch practice rockets, were found leaning against the fence along the access road. Item 17, a practice rifle grenade, was found leaning against a tree, next to an abandoned bus. None of these three items were embedded in the topsoil or vegetation, all were above the vegetation deadfall, and all pointed in a direction incompatible with impact from the firing area.

4.2 Nature and Extent of MC

For the purpose of identifying the MC compounds of interest, in accordance with the MC SAP, soil and sediment results were screened against the following screening criteria:

- Soil
  - **Site-specific EALs**. As indicated in the approved Work Plan (and its Appendix C, the MC SAP) and agreed during the project planning meeting of 20 April 2009 (see Attachment E of the MC SAP for additional details), the HDOH direct exposure EALs were used for evaluation of nature and extent of contamination in soil. HDOH EALs for leaching to groundwater were not considered applicable because groundwater is not a media of concern at the

MRS[6] (see Worksheets 9 and 10 of the MC SAP). The Ecological Risk Evaluation conducted in 2009 based on the 2008 SI results (CH2M HILL, 2009) concluded that no risk to ecological receptors existed with respect to soil at the MRS. Therefore, groundwater protection EALs and terrestrial ecotoxicity EALs were not applicable during the RI at the MRS. The EALs for unrestricted land use sites where drinking water is threatened and the nearest surface water body is within less than 150 meters were used (HDOH, Summer 2008, updated March 2009).

  - **May 2010 EPA Residential Regional Screening Levels (RSLs)**. Because no HDOH EAL is available for aluminum and iron, the RSL values are considered for these compounds.
  - **Background** heavy metal concentrations in Koolau volcanic soil in accordance with Navy Policy on the Use of Background Chemical Levels. The estimated background concentration ranges are contained in the *Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii* (Earth Tech, June 2006)[7].

- <u>Stream Sediment</u>
  - **NOAA Sediment Quality Guidelines (Buchman, 2008).** In accordance with the Work Plan (Worksheet 11 [USAE, February 2009]), the NOAA sediment benchmarks chosen for this project are based on the lowest effect level (LEL) for inorganics in freshwater sediment. This LEL of sediment contamination can be tolerated by the majority of benthic organisms[8].
  - **2004 EPA Region III Biological Technical Assistance Group (BTAG) Freshwater Sediment Screening Benchmarks.** These screening levels were used only for compounds that are not included in the NOAA Sediment Quality Guidelines.

Note that comparison of results to hazard-specific EALs is conducted later, as part of the EHE (Section 5.0). Because a baseline risk assessment was conducted for the MRS (described in Sections 5.0 and 7.0, respectively), the results of this initial screening against the HDOH direct exposure EALs for soil and NOAA quality benchmarks for sediment should not be construed as an indication of potential risk to humans and the environment at the site.

6 It is assumed that little water may infiltrate and accumulate in small pockets in the bedrock. However, because of the steep terrain and underlying rock strata, rain water at the MRS preferentially flows towards Waikane Stream and is then transported to the Pacific Ocean, approximately one mile downstream from the site. Additionally, the main contaminants of potential concern at the site are metals, which are not soluble in water under site-specific (non acidic) conditions.

7 Two soil samples were also collected at the site at locations where no MECs were found (in correspondence of the MRS gate and north of AOC4) to determine a site-specific background value for metals. However, values provided in the Earth Tech 2006 document provide a statistically more representative population and are considered for nature and extent purposes.

8 The LEL-based screening benchmarks are only used for nature and extent. The ones used for risk assessment are based on threshold and probable effects concentrations (TEC and PEC).

In accordance with the MC SAP, results were evaluated in terms of surface soil (0 to 0.5 foot bgs), subsurface soil (0.5 to 3 feet bgs[9]), and stream sediment. Table 3-7 lists the samples that were used for evaluation of contamination in soil and sediment, respectively. The potential impact derived from BIP operations is also evaluated, considering surface soil data collected pre- and post-venting activities at AOC-02, AOC-03, and AOC-04.

Summary tables are provided to give an overview of the compounds detected in surface soil (MI and discrete sampling), subsurface soil, and sediment; these tables are discussed below and include the number of detections, number of samples, frequency of detection, minimum and maximum method detection limits (MDLs), minimum and maximum detected values, and exceedances of screening criteria.

4.2.1 Surface Soil (0-0.5 foot bgs)

For surface soil, two different types of data are available from the 2010: MI sampling and BIP sampling conducted during RI activities. Although the media of concern is the same, results of these activities are discussed separately because they had different objectives, and different procedures were applied. Data were evaluated as follows:

- Metals were analyzed in surface soil samples (both discrete and composite samples) during the 2008 SI. Laboratory analyses resulted in concentrations above screening criteria only for copper and lead. These two compounds were further evaluated in 2010 during the MI sampling effort, which included the locations where metals exceeded screening criteria in 2008 (see Figure 2-2). In accordance with HDOH guidance (HDOH, Summer 2008, updated March 2009), the use of MI samples is strongly preferred, to enhance sample representativeness. Therefore, only the 2010 MI samples are considered for evaluation of nature and extent of copper and lead in surface soil, while distribution of other metals is discussed in Section 4.2.2 below, as part of the evaluation of the impact on surface soil from BIP activities.

- Explosive compounds were analyzed in surface soil samples (both discrete and composite samples) during the 2008 SI. Laboratory analyses resulted in concentrations below the project screening criteria and these compounds were not included in the analytical plan for the 2010 MI sampling effort. However, explosive compounds and other metals (besides copper and lead) were analyzed in surface soil discrete samples during the 2010 BIP sampling effort to evaluate the impact of venting operations. Therefore, the 2010 BIP discrete samples are considered for evaluation of nature and extent of explosive compounds.

Results are discussed accordingly in the following sections.

4.2.1.1 Copper and Lead (MI Sampling)

Surface soil samples were collected from 10 decision units during the 2010 RI, using the MI sampling method (30 increments for each sample) described in Section 3.2.1. Three replicates from each decision unit were analyzed for copper and lead. The results are summarized in Table 4-1. Mean, standard deviation, and relative standard deviation (RSD) were calculated for each detected compound within each decision unit and are indicated in Table 4-2, where a more detailed evaluation is provided.

---

9 Subsurface soil samples were collected at 2 and 3 feet bgs.

The Interim Final *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan* (HDOH, June 21, 2009) provides recommendations for statistical evaluation and interpretation of MI sampling results, noting that an RSD of approximately 35 percent or less is within a reasonable range to consider averages for decision-making. The project MC SAP specified a value of 50 percent or less as acceptable[10].

As indicated in Table 4-2, RSD values above 50 percent were found at the following DUs, indicating that the mean concentration is not representative of the specific DU possibly because of a highly heterogeneous soil and/or distribution of compounds of interest:

- DU-3 (AOC-02), with concentrations of lead varying between 7.5 mg/kg and 36 mg/kg for the three replicate samples, resulting in a mean of 20 mg/kg, with an RSD of 72 percent.
- DU-6 (AOC-03), with concentrations of copper varying between 71 mg/kg and 350 mg/kg for the three replicates, resulting in a mean of 197 mg/kg with an RSD of 72 percent. Also lead varied between 43 mg/kg and 140 mg/kg, a mean of 94 mg/kg, with an RSD of 52 percent.
- DU-7 (AOC-03), with concentrations of copper varying between 250 mg/kg and 5,000 mg/kg for the three replicates, a mean of 1,867 mg/kg, and an RSD of 145 percent.
- DU-9 (AOC-04), with concentrations of lead varying between 6.7 mg/kg and 33 mg/kg for the three replicates, a mean of 16 mg/kg, and an RSD of 94 percent.

Because of this high variability in three of the four AOCs (and four of the 10 DUs) where MI sampling was conducted, the maximum concentrations of each compound from the three replicate samples were conservatively used for evaluating contaminant nature and extent at all DUs and evaluating site-specific risk. The following compound exceeded both the background concentrations and the site-specific EALs (see Tables 4-1 and 4-2, and Figure 4-2):

- **Copper -** Concentrations of copper above the site-specific EAL of 630 mg/kg were detected in DU-7 (the topographically lowest and southern most part of AOC-03), where 5,000 mg/kg of copper were detected in one of the replicate samples.

Based on the results above, the following conclusions were drawn regarding the extent of metal compounds in surface soil:

- Concentrations of metals in surface soil appear to be variably distributed, possibly due to soil heterogeneity. As a result, there is little confidence that average concentrations follow a normal distribution and are not adequately representative of the DUs (at least for DU-3, DU-6, DU-7, and DU-9, where RSDs above 50 percent were found).

---

[10] Note that the MC SAP, in Worksheet 12, presents relative percent difference instead of RSD for MI replicate samples evaluations. The former parameter is used to calculate the relative difference between two values and it is not applicable to evaluate triplicate data sets.

- Based on 2010 RI data, copper contamination above the direct exposure EAL is limited to AOC-03 (DU-7).
- As Table 4-2 and Figures 3-2 and 3-3 indicate, relatively higher copper concentrations appear to correspond to areas where a higher density of MPPEH and MEC items were found during surface clearance and intrusive investigations.

4.2.1.2 Explosive Compounds

Twenty discrete soil samples (10 before and 10 after BIP operations) were collected in 2010 during venting activities and analyzed for explosive compounds[11]. Nature and extent of explosive compounds is discussed below, while the potential impact of BIP activities on surface soil is discussed in Section 4.2.2.

As summarized in Table 4-3 and depicted in Figure 4-3, the following explosive compounds exceeded the site-specific EALs (see Table 4-4 for the complete set of results from 2010 BIP sampling activities):

- **2,4,6-trinitrotoluene** (TNT) – TNT was detected at concentrations above the site-specific EAL of 7.2 mg/kg in one of the 23 samples collected during the 2010 RI BIP activities. The exceedance (8.2 mg/kg) was reported for sample WVIA-B-004A, collected in the northern portion of AOC-03 before the BIP operations were completed at location WVIA-B-004 (see Section 4.2.2 for additional details on results of BIP samples).

Based on the results above, the following conclusions were drawn regarding the extent of explosive compounds in surface soil:

- Concentrations of explosive compounds in surface soil above the site-specific EALs are limited to AOC-03.
- TNT is the only explosive compound exceeding the site-specific EALs. Its presence above screening criteria is most likely related to past artillery, and mortar firing activities conducted at the MRS (a 3.5-inch rocket high explosive anti-tank [HEAT], possibly containing TNT in the filler). TNT is not a component of the explosive perforators used for BIP operations.

4.2.2 Potential Impact from BIP Activities

All MEC and MPPEH items containing explosives found during surface clearance and intrusive operations were vented/demilitarized in place on March 18, 25, and 30, and April 1, 15, and 29. Surface, discrete soil samples were collected both before, and after venting operations to evaluate the potential impact of these activities on surface soil. A total of 23 soil samples (including two quality control samples) were collected between 0 and 0.5 foot bgs, and analyzed for metals and explosive compounds. The analytical results are reported in detail in Table 4-4 and are discussed below.

Concentrations above both the site-specific EALs and the background levels were found at the following locations during BIP operations (see Figure 4-3):

---

[11] Both 2008 SI and 2010 BIP samples were also analyzed for metals, but nature and extent of metals is evaluated considering the MI samples collected in 2010 during the RI activities.

- **WVIA-B-003** - Concentrations of antimony in surface soil did not vary significantly at this sampling location. A concentration of 44 mg/kg was reported for the pre-BIP sample and 45 mg/kg was reported for the post-BIP sample. Both samples were above the background concentration (6.9 mg/kg) and the site-specific EAL (6.3 mg/kg).

- **WVIA-B-004** – At this sampling location, concentrations of antimony in surface soil did not vary significantly: 40 mg/kg (pre-BIP sample) to 43 mg/kg (post-BIP sample). Both samples were above the background concentration (6.9 mg/kg) and the site-specific EAL (6.3 mg/kg). Concentrations of TNT were significantly higher in the pre-BIP sample (8.2 mg/kg), above the site-specific EAL, and non-detect (<0.21 mg/kg) in the post-BIP sample.

- **WVIA-B-005** - Concentrations of antimony in surface soil did not vary significantly, from 51 mg/kg (pre-BIP sample) to 52 mg/kg (post-BIP sample). The samples were both above the background (6.9 mg/kg) and the site-specific EAL (6.3 mg/kg). Reported concentrations of copper at this location were 180 mg/kg (pre-BIP sample) and 1,300 mg/kg (post-BIP sample). The post-BIP sample is above the background concentration (183 mg/kg) and the site-specific EAL (630 mg/kg).

- **WVIA-B-006** - Concentrations of antimony in surface soil at this location were 41 mg/kg (pre-BIP sample), above both background (6.9 mg/kg) and the site-specific EAL (6.3 mg/kg), and 6.6 mg/kg (post-BIP sample), above the site-specific EAL, but below the background level. Sample WVIA-B-007A was the field duplicate of the pre-BIP sample collected at location WVIA-B-006; as shown in Table 4-4, the results of the field duplicate were consistent (46 mg/kg of antimony, while copper was below the site-specific EAL) with the parent sample.

- **WVIA-B-008** - Concentrations of antimony in surface soil at this location were 43 mg/kg (pre-BIP sample), above both background (6.9 mg/kg) and the site-specific EAL (6.3 mg/kg), and 4.4 mg/kg (post-BIP sample), below the screening levels.

- **WVIA-B-009** - Concentrations of antimony in surface soil at this location were 37 mg/kg (pre-BIP sample), above both background (6.9 mg/kg) and the site-specific EAL (6.3 mg/kg), and non-detected (post-BIP sample)[12].

- **WVIA-B-010** - Concentrations of antimony in surface soil at this location were 36 mg/kg (pre-BIP sample), above both background (6.9 mg/kg) and the site-specific EAL (6.3 mg/kg), and 7.6 mg/kg (post-BIP sample), still above the screening levels.

- **WVIA-B-011** - Concentrations of antimony in surface soil at this location were 51 mg/kg (pre-BIP sample), above both background (6.9 mg/kg) and the site-specific EAL (6.3 mg/kg), and non-detected (post-BIP sample)[13]. Concentrations of copper were 140 mg/kg (pre-BIP sample) and 850 mg/kg (post-BIP sample), above the background (183 mg/kg) and the site-specific EAL (630 mg/kg).

[12] The MDL of the post-BIP sample is higher than the screening criteria.
[13] The MDL of the post-BIP sample is higher than the screening criteria.

Sample WVIA-B-012B was the field duplicate of the post-BIP sample collected at location WVIA-B-012; as shown in Table 4-4, the results of the field duplicate were different (higher for antimony and lower for copper) than in the parent sample, possibly due to heterogeneities in the soil and contaminant distribution.

Based on the analytical results discussed above, the following conclusions were drawn regarding the potential impact of BIP operations on subsurface soil:

- Although antimony is a component of explosive perforators which were used as donor charges for demolition, no significant increase in antimony concentrations was observed following venting operations, when compared to the pre-BIP results (see Figure 4-3).
- Widespread and approximately constant concentrations of antimony are observed at 80 percent of the BIP locations, and the detected concentrations generally exceed background antimony concentrations in Koolau volcanic soils (6.9 mg/kg). Antimony was not detected at the remaining BIP locations, in the two site-background samples, and in the majority of the 2008 SI locations (antimony was detected in only seven out of the 50 2008 SI samples with maximum concentration of 4.3 mg/kg). These data suggest the relatively high concentrations of antimony in soil at the BIP locations, are most likely because of past arms firing activities, and not related to BIP operations (antimony is a common constituents of small arms ammunitions).
- An increase in copper concentrations was observed in the post-BIP samples at some locations where HE items were vented, indicating that the detonation may have released some of the copper (see Figure 4-3). Although concentrations were below the screening levels, a similar behavior (that is, relatively higher concentrations in the post-BIP samples) was observed also for lead.
- Relatively high concentrations of TNT detected in the pre-BIP sample at location WVIA-B-004 (see Figure 4-3) may be because of past artillery, and mortar firing activities conducted at the MRS (a 3.5-inch rocket HEAT), possibly containing TNT in the filler, was found at this location). The observed decrease in the TNT concentration following the BIP operations could be due to relatively high concentrations associated with a small portion of the surface soil that were dispersed following the explosion, or could be the result of soil heterogeneity.

4.2.3 Subsurface Soil (0.5-3 feet bgs)

A total of 23 subsurface soil samples were collected at the MRS at depths of 2 and 3 feet bgs and analyzed for copper and lead. Two additional samples were collected north of AOC-04 and at the site entrance between 0 and 0.5 foot bgs and at 2 feet, respectively, and were analyzed for a broader set of metal compounds to verify background levels. Although concentrations of arsenic and iron were detected above the site-specific EAL in the background samples (see Tables 4-5 and 4-6 for a summary and details of results, respectively), concentrations of copper and lead in subsurface soil at the MRS were below the site-specific EALs and the Koolau volcanic soil background values. Based on available data, subsurface soil is not contaminated above EALs or background concentrations, and is not evaluated further.

4.2.4 Sediment

Sediment samples were collected along the Waikane stream at upstream, midstream, and downstream locations. Four normal samples (plus one FD sample) were collected and analyzed for cobalt, copper, lead, mercury, and RDX. Samples were composited homogenizing 10 sub-samples collected between 0 and 0.5 foot below the stream bed at approximately equally-spaced intervals.

Results are summarized in Table 4-7, while the complete data set results are provided in Table 4-8. Concentrations above the applicable limits (NOAA Sediment Quality Guidelines and BTAG Freshwater Sediment Screening Benchmarks[14]) were detected for the following compound (see Figure 4-4):

- **Copper** – Copper was detected above the NOAA freshwater sediment screening criteria (16 mg/kg) in four out of four samples, with concentrations that are fairly consistent along the three sections of the stream, ranging from 95 mg/kg and 110 mg/kg.

Based on the results above, the following conclusions were drawn regarding the extent of copper contamination in surface soil:

- Contamination of the Waikane Stream sediments is limited to copper. Concentrations are fairly consistent along the three sections of the stream.
- Contamination of stream sediments could be associated with copper-contaminated soil particles entrained and transported to Waikane Stream by stormwater run-off from the southern portions of the AOCs, where the highest concentrations of copper in surface soil were found.
- Concentrations of copper in the stream sediment are lower than the Koolau volcanic soil levels. Therefore, considering the transport mechanism described above, relatively high concentrations of copper in sediment could be due to background levels.

4.3 Updated Conceptual Site Model

This section presents the updated CSM for the MRS. This model is depicted in Figure 4-5 and illustrates the potentially complete human and ecological exposure pathways for the MEC and the site-related chemicals in soil and sediments. The factors considered in the development and updates of the CSM are discussed in this section. Additional details on exposure pathways for MCs are provided in Section 7.0.

The CSM represents the current understanding of site characteristics. It is based on available site information, including the 2008 SI and 2010 RI findings, the current and reasonably anticipated future land uses, present ecological habitat, and potential beneficial uses of surface water in the vicinity of the MRS. The model has been developed according to the EPA (EPA, December 1989) and NAVFAC (Conceptual Site Models, Environmental

[14] The laboratory reporting limits for RDX were higher than the EPA Region III BTAG Freshwater Sediment Screening Benchmark.

Restoration Technology Transfer [ERT2][15]) guidance, and using professional judgment and information on MEC, contaminants present at the site, potential and known sources, release mechanisms, migration pathways, potential exposure pathways, and potential receptors.

Sections 4.3.1 and 4.3.2 describe the current and reasonably anticipated future land uses, and groundwater and surface water resources that could affect the potential exposure pathways for human and ecological receptors. Sections 4.3.3 and 4.3.4 summarize the characteristics of the contaminants and the potential sources and release mechanisms. Sections 4.3.5 and 4.3.6 describe exposure pathways for potential human and ecological receptors, respectively.

4.3.1 Current and Potential Future Land Uses

Information on current and reasonably anticipated future land uses was used to identify potentially exposed populations and to determine exposure patterns for the environmental media sampled and analyzed at the MRS.

The land at the MRS is currently classified as open space/preserve areas, agricultural areas, and nature preserve areas in the Koolaupoko Development and Sustainable Communities Plan (Map A-2; Section 1: Kahaluu – see Appendix G of this RI Report) published by the Department of Planning and Permitting of the City & County of Honolulu (City and County of Honolulu, August 2000). The site is bounded to the north, south, and west by undeveloped forest land. Residential and recreational areas are present east of the MRS.

The 34 acres at the southernmost end of the site consists of flatter terrain that is potentially appropriate for agricultural use, and in fact much of that land has been used for taro farming. The remaining acreage within Waikane Valley consists of inaccessible terrain that cannot be developed due to steep gulches, canyons, rocky outcrops, and mountains rising over 2,200 feet above sea level. Although site access is controlled (the area is fenced and warning signs posted), evidence exists that accessible portions of Waikane Valley have been used, and likely will continue to be used, by hunters and hunting dogs tracking wild boar and other game.

4.3.2 Groundwater and Surface Water Resources

The MRS is located in the Koolau Rift Zone groundwater area of Oahu. This area consists mostly of dike-intruded Koolau Basalt, which is the principal aquifer. Regional groundwater movement is from the highlands to adjacent groundwater areas and directly to the coast. According to the HDOH map of Oahu's Underground Injection Control (UIC) Areas, the MRS lies inland of the UIC line, and therefore the underlying aquifer is considered a potential drinking water source.

Although the depth to groundwater has not been determined at the site, it is believed that relatively small portions of infiltrating rainwater infiltrate into the ground and accumulate on perching layers to form small pockets of perched groundwater. However, because of the steep terrain and underlying rock strata, it is assumed that the bulk of rainwater preferentially flows downslope as runoff towards Waikane Stream and then is transported to the Pacific Ocean, approximately one mile downstream from the site. Stormwater run-off is believed to be an important factor at the MRS and is responsible for the significant erosion observed at site. Because of the limited potential for groundwater development in the area,

[15] http://www.ert2.org/ert2portal/DesktopDefault.aspx

relatively insoluble nature of the contaminants, as concurred during the systematic planning meeting of 20 April 2009, groundwater protection is not a concern at the MRS.

Waikane Stream traverses the project site along its southern border at an elevation of approximately 150-feet. The USGS has monitored stream flow at the 75-foot elevation level approximately 1,150 feet downstream from the eastern border of the property since 1959. Its records indicate Waikane Stream to be perennial (Belt Collins & Associates, July 1990). Water quality sampling of the perennial Waikane Stream was accomplished in May 2003 and good water quality was reported (AECOS Consultants, 2003).

Since 1916, the Waiahole Ditch Tunnel System has diverted water from the most productive portion of the Waikane watershed, upstream from the site, for agricultural use in leeward Oahu, thereby altering flow volume and other hydrological characteristics of Waikane Stream (Drigot et. al. 2001).

4.3.3 MEC and MC Characteristics

Investigation activities conducted at the MRS during surface clearance and sampling activities resulted in the discovery of MEC, MPPEH, and MDAS, and MC at concentrations exceeding HDOH direct exposure EALs and/or background concentrations. Surface clearance operations were conducted during the RI over an area of approximately 11 acres across AOC-01, AOC-02, AOC-03, and AOC-04. Intrusive operations were also conducted to a maximum depth of 4 feet bgs over a total of 0.8 acres at the site. The following MEC, classified as UXO because they appeared to be fuzed and fired, were found:

- M28 rifle grenades – 9 on surface and 1 subsurface (1 inch below ground surface)
- 2.36-inch rockets – 5 on surface
- 3.5-inch rockets – 9 on surface

The UXO were mainly concentrated across AOC-02, AOC-03, and AOC-04 (see Figure 4-1), over an area of approximately 40 acres. Access to the MRS is controlled by a fence with warning signs posted in English and Japanese. However, trespassers and future human receptors could be exposed to UXO potentially present in the munitions concentration area shown in Figure 4-1 and in the area around it. No MEC, MPPEH, or MDAS were found south of the Waikane Stream during the RI.

Additionally, the following compounds were found at concentrations above the site-specific EALs and the Koolau volcanic soil background levels (where applicable) during the RI activities:

- **Surface Soil**: antimony, copper, and TNT
- **Sediment**: copper

A brief description of the main characteristics and relevant fate and transport mechanisms for these contaminants is provided below and is based on information retrieved from the database of the Agency for Toxic Substances & Disease Registry (ATSDR) and on field observations.

Antimony

Antimony (CAS No. 7440-36-0) is a metalloid (that is, it exhibits both metallic and non-metallic characteristics) usually mixed with other metals, such as lead and zinc, to form mixtures of metals called alloys. These alloys are used in lead storage batteries, solder, sheet and pipe metal, bearings, castings, type metal, small arms ammunitions, and pewter (ATSDR, September 1992). It is also a component of the explosive perforators used as donor charges for demolition.

Antimony can also occur naturally in rocks. As reported by Earth Tech (June 2006), the background concentration (95th percentile) of antimony in the Koolau volcanic soil is 6.9 mg/kg.

Antimony is not volatile and generally not soluble in water. When released to the ground, most antimony strongly attaches to soil or sediment particles containing iron, manganese, or aluminum and is transported with them.

The primary potential exposure routes for antimony at the MRS are incidental ingestion and inhalation of soil particles containing this compound, and direct soil contact.

Copper

Copper (CAS No. 007440-50-8) is a reddish metal that occurs naturally in rock, soil, water, sediment, and, at low levels, air. Its background concentration (95th percentile) in the Koolau volcanic soil is 183 mg/kg (Earth Tech, June 2006). This compound is primarily used as pure metal or alloy in the manufacture of wire, sheet metal, pipe, and other metal products (ATSDR, September 2004). Copper compounds are also used in agriculture to treat plant diseases, for water treatment, as preservatives for wood, leather, and fabrics, and in the manufacture of munitions (cases and primers).

Copper is not volatile and it is generally insoluble. When released to the ground, copper strongly attaches to fine soil or sediment particles containing organic material in the top layers of the surface and may not move very far. Even though copper binds strongly to suspended particles and sediments, there is evidence to suggest that some water-soluble copper compounds do enter groundwater. Copper that enters water eventually collects in the sediments of rivers, lakes, and estuaries.

The primary potential exposure routes for copper at the MRS are incidental ingestion and inhalation of soil or sediment particles containing this compound or through direct contact.

TNT

TNT is a yellow, odorless, solid manufactured compound that does not occur naturally in the environment. It is made by combining toluene with a mixture of nitric acid and sulfuric acid to form highly explosive compounds.

TNT is used as an explosive in bombs, rockets, and grenades. It has been widely used for filling shells and airborne demolition bombs since it is sufficiently insensitive to the shock of ejection from a gun barrel but can be exploded on impact by a detonator mechanism (ATSDR, June 1995). TNT is used either as the pure explosive or in binary mixtures (ATSDR, June 1995). The most common binary mixtures of TNT are cyclotols (mixtures with RDX), octols (mixtures with HMX), amatols (mixtures with ammonium nitrate), and tritonals (mixtures with aluminum) (ATSDR, June 1995). In addition to military use, small amounts of TNT may be used for industrial explosive applications.

The compound is characterized by relatively low vapor pressure (1.99x10-4 mm of mercury at 20 degrees Celsius [°C]) and relatively high water solubility (130 mg per liter at 20 °C)

(ATSDR, June 1995). The soil organic carbon adsorption coefficient (Koc) ranges between 300-1,100 and the log octanol/water partition coefficient (Kow) was estimated between 2.2-2.7 (ATSDR, June 1995). The explosive temperature is 464 °F (240 °C).

Based on the characteristics listed above, when released to the environment, TNT is expected to move through soil dissolved into infiltration water. Solid chunks of TNT buried in soil or exposed on the soil surface can persist for many years (ATSDR, June 1995). In smaller amounts, TNT may undergo photolysis in surface soils to trinitrobenzene and trinitrobenzaldehyde (ATSDR, June 1995).

The primary potential exposure routes for TNT at the MRS are incidental ingestion and inhalation of soil particles containing this compound or through direct contact.

4.3.4 Potential MEC and Contamination Sources and Release Mechanisms

Based on the SI and RI data, the presence of MEC and MC at the MRS are associated with the military activities (small arms, shoulder fired rockets, artillery, and mortar firing) conducted in the area in the past. The CSM shown in Figure 4-5 summarizes the site-specific sources and depicts the potential primary and secondary release mechanisms. Evaluation of the model indicates that the overall releases and potential transport mechanisms for the MRS include the following:

- MEC present at the surface/subsurface (down to 1 foot bgs)
- Explosions from military activities, resulting in MC being distributed in surface soil
- Corrosion of MEC and degradation of MC, resulting in MC being redistributed in the surface soil
- Stormwater run-off and erosion, resulting in previously buried MEC potentially being exposed and transported downslope of the AOCs
- MC in surface soil being transported to areas downslope of the AOCs and to Waikane Stream via stormwater runoff and/or erosion
- Leaching of contaminants from surface soil to deeper soils or groundwater

As discussed above and in Section 5, the migration pathway for MC in soil to groundwater is considered insignificant at the MRS because of the steep slopes and the proximity of the Waikane Stream create a preferential pathway for overland flow with the bulk of stormwater flowing downslope towards the Waikane Stream, with limited migration to perched or deeper basal groundwater. Additionally, two of the three compounds of potential concern (antimony and copper) are relatively insoluble in water and preferentially partition to soil particles when released to the ground. Groundwater is therefore not considered as an exposure media at the MRS. This approach was discussed during the project planning meeting of 20 April 2009, and agreed upon by HDOH and project stakeholders. Also, HDOH agreed that surface water in Waikane Stream does not represent a media of concern and would not need to be sampled, as sediment samples are more representative of contaminants potentially present in the stream along the potentially complete pathway to the stream surface water and sediments via surface water runoff.

Migration pathways for MC to offsite receptors are incomplete for all exposure media and routes because of the relatively insoluble characteristics of the contaminants (copper and antimony), and the distance from the site to offsite receptors.

The following subsections describe the potential human and ecological receptors and potentially complete exposure pathways based on these release mechanisms.

4.3.5 Potential Human Receptors and Exposure Pathways

Based on current and potential future land uses of the site, potentially complete exposure pathways exist for the following human exposure scenarios:

- **Site Trespassers:** The MRS is currently fenced with warning signs posted in both English and Japanese. However there is evidence that trespassing occurs frequently at the site. Trespassers could be exposed to MEC by contact (while walking and/or digging to 2 feet bgs), and to MCs in surface soil (down to 3 feet bgs) by incidental ingestion, dermal contact, and inhalation of dust. Exposure to MCs in stream sediment could occur through incidental ingestion or dermal contact.

- **Future Hikers and Swimmers (Recreational Scenario):** Potential exposure of future recreational receptors (hikers and swimmers) could occur to MEC by direct contact (while walking and/or digging to 2 feet bgs), and to MCs in surface soil (down to 3 feet bgs) by incidental ingestion, dermal contact, and inhalation of soil dust particles. Exposure to MCs in stream sediment could occur through incidental ingestion or dermal contact.

- **Hypothetical Future Excavation and Construction Workers:** Potential exposure of hypothetical future excavation and construction workers could occur to MEC by direct contact (while walking and/or digging to 2 feet bgs), and to MCs in surface soil (down to 3 feet bgs) by incidental ingestion, dermal contact, and inhalation of soil dust particles.

- **Hypothetical Future Residents:** Potential exposure of hypothetical future residents to MEC could occur by direct contact (while walking and/or digging to 2 feet bgs), and to MCs in surface soil (down to 3 feet bgs) by incidental ingestion, dermal contact, and inhalation of soil dust particles.

4.3.6 Potential Ecological Receptors and Exposure Pathways

Based on the current understanding of the site, potentially complete exposure pathways exist for the following ecological exposure scenarios:

- **Aquatic and Terrestrial Ecological Organisms:** Potential exposure of aquatic organisms to MCs in sediment by incidental ingestion and dermal contact, and terrestrial organisms to MCs in surface soil (down to 0.5 foot bgs) by incidental ingestion and dermal contact.

The ecological receptor groups potentially exposed at the MRS are terrestrial and aquatic wildlife. The Hawaiian short-eared owl, or *Pueo*, is considered as a conservative avian receptor for terrestrial wildlife at the site because it is a species of concern in the State of Hawaii and it could at times forage on rodents or small animals at the MRS.

5.0 Environmental Hazard Evaluation

This section provides the results of the EHE for the MRS. The EHE was developed in general accordance with guidance provided in *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater* (HDOH, Summer 2008, updated March 2009). This assessment is limited only to hazards associated with exposure to MC. Physical hazards associated with MEC presence are addressed in Section 6.0.

The Nature and Extent of Contamination summary provided in Section 4.2 compared data to the site-specific EALs and applicable background concentrations. In accordance with the decisions concurred on during the project planning meeting of 20 April 2009, the direct exposure EALs were used for evaluation of nature and extent of contamination in soil because the groundwater is not a pathway of concern at the MRS and the 2009 Ecological Risk Evaluation (CH2M HILL, 2009), based on SI data, resulted in no risk to ecological receptors at the MRS. Therefore, groundwater protection EALs and terrestrial ecotoxicity EALs were considered not applicable during the RI at the MRS (USAE, February 2010). The direct exposure EALs for unrestricted sites where drinking water is threatened and the nearest surface water body is within less than 150 meters were considered (HDOH, Summer 2008, updated March 2009).

This section identifies specific environmental hazards posed by the detected MC contamination, further comparing site-specific EAL exceedances to hazard-specific EALs. In this tiered approach, only contaminants that were found at concentrations above the site-specific EALs were carried over to the EHE stage and were evaluated against hazard-specific EALs. Although comparison to the direct exposure EALs was already conducted in Section 4.2 to evaluate the nature and extent of contamination, direct exposure hazards are further discussed within the EHE for completeness.

A summary of the surface soil RI data evaluation against hazard-specific EALs is included in Table 5-1. The areas where potential hazards exist are depicted in Figure 5-1. Media other than surface soil were not evaluated in this EHE because they either are not a concern at the MRS (subsurface soil, soil gas, and groundwater) or no hazard-specific EALs are provided by HDOH guidance (sediments).

For surface soil, different types of data are available. Copper was sampled both during the 2008 SI (discrete sampling) and the 2010 RI (MI sampling). Since the MI data are more recent, include the 2008 EAL exceedance locations, and are considered more representative than SI data, the 2010 MI samples were considered for copper. As discussed in Section 4.2.1.1, because of the high variability of results for the three replicate samples collected in each DU during MI sampling of metals, the maximum concentrations of copper in replicate samples were conservatively considered for the EHE.

During the RI, antimony and TNT were detected in surface soil samples at concentrations above the HDOH EALs and therefore are being evaluated as part of the EHE.

Therefore, the hazard areas shown in Figure 5-1 were drawn using different types of data and their extent was estimated using two different methods, as follows:

- **Gross Contamination Hazard Area** – As described below, gross contamination hazards are related to high concentrations of copper detected in DU-7 during MI sampling. Since the exceeding MI sample is considered representative of the whole DU area, DU-7 corresponds to the gross contamination hazard area.
- **Direct Exposure Hazard Area** - Thiessen polygons were used to draw potential direct exposure areas centered on each sampling location ("s") with direct exposure EAL exceedances and included all points closer to "s" than to any other sampling location. This leads to a very conservative hazard estimate because Thiessen polygons are based on the assumption that the contaminant concentration detected at each sample location "s" is representative of the entire polygon (that is, the concentration is assumed the same throughout each specific cell). Additionally, since it appears that MC distribution is associated to MEC/MPPEH occurrence, the polygons were cut off at the AOC boundaries (that is, MEC and MPPEH were mainly found within AOC-02, AOC-03, and AOC-04,).

5.1 Surface Soil

Soil analytical data were compared to the EALs for the following potential hazards:

- Gross contamination
- Human direct exposure (based on unrestricted land use)

As specified below, other hazard-specific EALs were not considered because they were either discarded during the project planning/work plan phase (leaching to groundwater and terrestrial ecological impact) or they are not provided for the specific compounds of potential concern (soil gas and vapor intrusion [that is, compounds of potential concern are not volatile]). As specified in the MC SAP, the ecological impact scenario was discarded based on the results of the 2009 ecological risk evaluation. Since new data are available from the RI, the risk evaluation was updated (see Section 7.0) and addressed any potential ecological hazard derived from newly collected data.

The following subsections summarize the EHE results associated with the surface soil samples that were collected at the site and exceeded the site-specific EALs. No evaluation was conducted on subsurface soil samples because the concentrations were all below the site-specific EALs. Hazards associated with the presence of MEC items at the MRS are evaluated in Section 6.0.

5.1.1 Gross Contamination

Gross contamination of soil generally refers to the presence of offensive odors, unaesthetic appearance, general resource degradation, or generation of explosive vapors (HDOH, Summer 2008, updated March 2009). Surface soil data (soil portion between 0 and 0.5 foot bgs) from the MI and BIP sampling activities were compared to gross contamination EALs for "Exposed or Potentially Exposed Soil" provided as Table F-2 in the HDOH EAL Surfer (HDOH, Summer 2008, updated March 2009).

Based on comparison to gross contamination EALs (see Table 5-1), soil sample WVIA-M-029, collected in DU-7 during MI sampling, was identified as posing potential gross contamination hazards because it exceeded the copper gross contamination EAL of 1,000 mg/kg. The potential gross contamination area is shown in Figure 5-1, and corresponds to the DU-7 area (approximately 2.8 acres or 13,552 square yards [yd2]). Assuming a thickness of contamination of 1 foot (or 0.333 yards, that is, the maximum depth at which MEC were found during intrusive work – copper, once released to soil strongly bonds to the soil and does not migrate far), the volume of surface soil potentially grossly contaminated is estimated at 4,510 cubic yards (CY). This estimate is extremely conservative because of the high copper concentration found in one of the replicate samples within DU-7. It is possible that this is an outlier sample driven by soil and contaminant distribution heterogeneities, and the actual concentration truly representative of DU-7 is lower, as indicated by the other two replicate sample concentrations which were 250 mg/kg and 350 mg/kg.

Because of the exceedances of gross contamination EALs, more specific components that may have contributed to a potential gross contamination at the site are evaluated below.

- 5.1.1.2 Odor Concerns

Pure copper at room temperature is non volatile and odorless. When combined with oxygen (copper oxides) some odor can result, but no odor thresholds are provided in the HDOH or ATSDR databases, or in the material safety data sheet (MSDS) (see Appendix H). No odor was noticed at the MRS during MI sampling activities in DU-7 or any other area.

Therefore, the exceedance of the gross contamination EAL for copper in surface soil sample WVIA-M-029 does not appear to cause odor hazards at the MRS.

5.1.1.3 Unaesthetic Appearance and General Resource Degradation Concerns

The contamination found at the MRS lies within the boundaries of DU-7, where no staining or other aesthetic concerns were observed during sampling activities. Additionally, no degradation of soil or vegetation was noted due to the surface soil contamination.

Therefore, the exceedance of the gross contamination EAL for copper in surface soil sample WVIA-M-029 does not appear to cause unaesthetic hazards at the MRS.

5.1.1.4 Explosive Vapor Concerns

As reported in the MSDS (see Appendix H), copper is not considered to be an explosion hazard. Therefore, the exceedance of the gross contamination EAL for copper in surface soil sample WVIA-M-029 does not appear to cause explosive hazards at the MRS.

5.1.2 Human Direct Exposure

Surface soil data were compared to the direct exposure EALs (Table I-1; HDOH, Summer 2008, updated March 2009) to screen whether contaminants in soil potentially pose risks to human health by direct contact. As highlighted in Table 5-1, the direct exposure EAL was exceeded at one MI sample location for copper and 5 BIP locations for antimony. Samples collected at BIP locations before detonation are not considered in the EHE because only the post (B) BIP samples are considered representative of current conditions.

Potential direct exposure areas are shown in Figure 5-1 and were generated using Thiessen polygons drawn around soil sample locations with direct exposure EAL exceedances. These areas add to a total extent of approximately 4.6 acres (approximately 22,265 yd^2). Assuming a thickness of contamination of 1 foot (or 0.333 yards, that is, the maximum depth at which MEC were found during intrusive work), the volume of surface soil with potential direct exposure hazards is estimated at approximately 7,420 CY. This estimate is conservative because it is assumes that copper concentrations in soil are above the direct exposure EAL in the entire hazard subarea, where only one sample is available.

5.1.3 Terrestrial Wildlife Exposure

Ecological exposure pathways were considered incomplete during the project planning/work plan phase based on the results of the 2009 ecological risk evaluation, which concluded that no unacceptable risk existed at the MRS for avian receptors (Hawaiian short-eared owl) potentially using the site habitat. Since new RI data are now available, the BERA was updated (see Section 7.0) and addressed any potential ecological hazard deriving from newly collected data that was not considered in this EHE.

5.1.4 Groundwater Protection

As concurred during the systematic planning meeting of 20 April 2009, groundwater protection is not a concern at the MRS (see Section 4.2.2 for details).

5.1.5 Vapor Intrusion

Contaminants at the MRS are not volatile and are not considered to be a vapor intrusion hazard.

5.2 Environmental Hazard Evaluation Conclusions

Based on the available data, it is concluded that the only potential hazard existing at the site for humans is associated with direct exposure due to antimony, copper, and TNT concentrations in surface soil above the direct exposure EALs. The estimated volume of soil with potential direct exposure hazards is 7,420 CY. Direct exposure concerns are addressed in Section 7.0 (Tier 2 Baseline Risk Assessment) to evaluate whether contaminant levels in the surface soil are protective for potential human and ecological receptors.

6.0 MEC Hazard Assessment

This section describes the methodology for conducting, and presents the results of, the hazard assessment (HA) for MEC items found at the MRS. The MEC HA addresses the explosives safety concerns posed by MEC to human receptors at the MRS. It does not address environmental or ecological concerns including potential risks associated with exposure to MCs as environmental contaminants, which are being evaluated in Section 7.0 (Tier 2 Baseline Risk Assessment). Figure 6-1 depicts all features that are relevant to the MEC HA within 4,000 feet of the MRS.

6.1 MEC HA Methodology

Direct contact with a MEC item could potentially lead to injury or death. The MEC HA evaluates the following three components of explosive hazard to human receptors: severity, accessibility, and sensitivity. *Severity* evaluates the potential consequences of the effect (death or injury) on a human receptor if an MEC item detonates. *Accessibility* describes the likelihood that a human receptor will be able to come in contact with an MEC item. *Sensitivity* assesses the likelihood that an MEC item will detonate if a human receptor interacts with it.

Each of these three components is evaluated by several input factors, which consist of various categories that are intended to describe site-specific conditions. Table 6-1 lists the input factors as well as the input factor categories for each component of explosive hazard.

In the MEC HA template, input factor scores for Type of Filler, MEC Classification, and MEC size will not change after clean-up. For example, a site with HE filler will not have a reduction in score from Not Treated to Surface Treatment or Subsurface Treatment. This structure of the template is to address the lack of certainty that all items containing HE can be found with current technologies.

Different weights are assigned to an input factor to calculate scores for each of the three components. Each input factor category is associated with a numeric score that reflects the relative contributions of a specific input factor. The scores are then summed to produce a final numeric score that is associated with one of four defined hazard level categories as follows:

- Category 1 – MEC HA Score of 840 to 1000 - site conditions present a high potential for an explosive event. These sites contain the most hazardous types of munitions and are easily accessible.
- Category 2 – MEC HA Score of 725 to 835 - site conditions present a potential for an explosive event. These sites contain hazardous munitions that are easily accessible.
- Category 3 – MEC HA Score of 530 to 720 - site conditions present a low potential for an explosive event under current land use conditions. An increase in the intensity of land use activities will increase the potential for an explosive event. These sites can

contain low numbers of hazardous munitions, can contain varying amounts of less hazardous munitions, may have undergone a level of clean-up that renders the site compatible with a restricted set of activities (e.g., activities restricted to surface use only), or may contain hazardous munitions but have very restricted accessibility and use activities.

- Category 4 – MEC HA Score of 125 to 525 - site conditions present a low potential for an explosive event even under high-intensity activities. The most common sites in this category have undergone a subsurface clean-up of MEC to a depth below that of the maximum depth of any intrusive activities that may occur.

The MEC HA supports the assessment of the baseline explosive hazards if no action is taken. It also provides an assessment of relative hazard reduction associated with changes in land use and various remedial action alternatives (for example, surface and/or subsurface clearance, land use controls, or combinations of these alternatives). Land use activities that present the highest potential hazard are those that take place outdoors and involve intrusive activities as with recreational or agriculture uses. Remedial alternatives entailing surface and subsurface clearance to the maximum potential intrusive depths generally provide the highest hazard reduction.

The MEC HA for the MRS was conducted using the MEC HA Automated Workbook V1.0.xls. For further details on the MEC HA methodology, refer to the EPA and DoD guidance document "*Munitions and Explosives of Concern Hazard Assessment Methodology - Interim*" (EPA, DoD, and U.S. Department of Interior, October 2008).

6.2 MEC HA Results

Based on the presence/absence of MEC at the site, the MRS can be divided into three areas as shown in Figure 8-1: the Southern Area (roughly south of Waikane Stream), the Target Area north of Waikane Stream, and the Non-Target Area north of Waikane Stream. All accessible areas south of the division line (Figure 8-1) were surveyed during the SI and the RI. A total of 2.92 acres of transects and grids were investigated in the Southern Area during the SI and RI combined. Additional undocumented acres were inspected by UXO personnel during the RI fieldwork while traversing through this area. No MEC, MPPEH, or MDAS were found in the 34-acre area south of the division line, except for three items (3, 6, and 17 in Figure 2-5) found during the SI that are assumed to have been carried out from the north side of the stream by trespassers. These items were found leaning against the fence (items 3 and 6), or a tree (item 17), near the access road, above the vegetation and free of soil, pointing in a direction incompatible with impact from the firing area. The three items were removed during the RI.

The Target and Non-Target Areas (approximately 153 acres) have been found to contain various MEC items during previous investigations as well as the RI. Therefore, the MEC HA for the MRS focuses on these two areas.

The Target Area encompasses AOC-02, AOC-03, and AOC-04, which had the same past munitions uses and current or reasonably anticipated future land uses. In particular, AOC-

02 through AOC-04 include areas with slopes 30 degrees or less (see Section 3.1, Table 3-1, and Figure 1-2 for details), making them more accessible to human receptors, and were found to contain high density of MEC items (over an estimated area of 40 acres[16]). MEC items found in the Target Area included 3.5-inch shoulder fired HEAT Rockets, 2.36-inch shoulder fired HEAT Rocket warhead, and HEAT Rifle Grenades.

The Non-Target Area has slopes that are generally greater than 30 degrees, making it less accessible by human receptors, and was found to contain a lower density of MEC items during the SI and RI. Steeper slopes were not surface cleared during the RI and therefore still contains high MEC hazards. Although MEC on steep slopes may move downslope over time in erodible areas, no MEC has been found to have migrated to the levels of Waikane Stream or into the Southern Area.

The automated Worksheets for estimating the MEC HA at the target and non-target areas of the MRS are provided in Appendix I.

In summary, the Target Area received a hazard level of "2" (indicating high potential explosive hazard conditions) for current and future land uses (open space, agricultural, and nature preserve areas) and would receive a hazard level of "3" (indicating moderate potential explosive hazard conditions) if surface or surface/subsurface clearance alternatives are proposed. Land use controls would not significantly reduce the hazard level of the target area compared to current conditions because the site is already fenced and access to the site area is limited.

The Non-Target Area (that is, the entire area north of Waikane Stream and outside of the "Munitions Concentrations Area" in Figure 4-1) received a hazard level of "3" (indicating moderate potential explosive hazard conditions) for current and future land uses (open space, agricultural, and nature preserve areas) and will receive a hazard level of "4" (indicating low potential explosive hazard conditions) if surface or surface/subsurface clearance alternatives are proposed. As with the Target Area, land use controls would not significantly reduce the hazard level of the site compared to current conditions because the site is already fenced and access to the site area is limited.

6.3 Munitions Response Site Prioritization Protocol

In 2001, Congress directed that the DoD identify and then prioritize their MRSs. The protocol was published as a rule on 5 October 2005 (35 CFR Part 179). The protocol was designed to: 1) maximize use of the latest MRS-specific data, and 2) be applied early in the munitions response process. The protocol assigns a relative priority to each location in the DoD's inventory of defense sites known or suspected of containing UXO, discarded military munitions, or MC, and prescribes procedures for prioritizing the defense sites and general component responsibilities.

The site priority ranking is based on the risk posed by potential hazards captured in data entered for three hazard evaluation modules of the munitions response site prioritization

[16] The 40-acre area with higher concentration of MEC includes parts of the MRS between the target AOCs.

protocol (MRSPP): explosive hazard evaluation module, chemical warfare material (CWM) hazard evaluation (CHE) module, and the health hazard evaluation (HHE) module. Separate MRSPP tables (explosive hazard evaluation Tables 1 through 10, CHE Tables 11 through 20, HHE Tables 21 through 28, MRS Priority Table 29, and MRS Background Information Table A) were completed.

MRS priorities range from 1 (highest priority) to 8 (lowest priority). Alternative module rates can include *evaluation pending*, *no longer required*, or *no known or suspected explosive (explosive, CWM, and/or MC) hazard*. Only sites with a CHE rating of A qualify for a MRS priority of 1. The Waikane Valley Training Area was not known or suspected to have CWM. MRS priorities were initially assigned to the site in 2007. Updated MRS priority tables are presented in Appendix J and summarized as follows:

- Explosive Hazard Evaluation Priority = 3
- CHE Priority = No known or suspected CVM
- HHE Priority = 5
- **MRS Priority = 3**

This space is intentionally left blank.

7.0 Tier 2 Baseline Risk Assessment

This section provides the results of the Tier 2 baseline risk assessment for the MRS, Kaneohe, on the island of Oahu, Hawaii, which consists of an HHRA (see Section 7.5) and an ERA (Section 7.6). This baseline risk assessment addresses pathways associated with potential exposure to MC in sediment and soil for estimating potential current and future human and ecological risks.

The overall objective of the baseline risk assessment is to determine whether MC at the MRS poses potentially unacceptable risks to human health and/or the environment and requires remedial action, or is eligible for a No Further Action designation. This risk assessment evaluate risks associated only with soil and sediment contamination; a No Further Action designation would also have to consider MEC hazards, which are not addressed by this risk assessment.

7.1 Organization of this Baseline Risk Assessment

This section consists of the following components of a Tier 2 baseline risk assessment:

- **Section 7.2, Risk Assessment Guidance.** Lists the primary guidance documents consulted during preparation of the HHRA and ERA.
- **Section 7.3, Constituents of Potential Concern.** Identifies the data used and constituents considered to be most important to the risk quantification process.
- **Section 7.4, Exposure Conceptual Site Model.** Provides a description of the physical setting, land uses, water beneficial uses, climate, ecological setting, and wildlife associated with the MRS, focusing on human and ecological exposure pathways. This section is intended to integrate the CSM described in Section 4.3.
- **Section 7.5, Human Health Risk Assessment.** Provides the results of the human exposure assessment, toxicity assessment, and risk characterization.
- **Section 7.6, Ecological Risk Assessment.** Provides the ecological scoping and problem formulation and results of the ecological risk characterization.
- **Section 7.7, Uncertainties and Assumptions.** Discusses the uncertainties and assumptions associated with the human and ecological risk assessments.

7.2 Risk Assessment Guidance

The following HDOH, EPA, and U.S. Navy guidance documents were consulted during the preparation of this baseline risk assessment:

- *U.S. Navy Human Health Risk Assessment Guidance* (Navy, 2008)

- *Guidance for Conducting Ecological Risk Assessments* (Navy, 2006)
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part A) Interim Final* (EPA, 1989a)
- *Screening For Environmental Hazards at Sites with Contaminated Soil and Groundwater* (HDOH, Summer 2008, updated March 2009)
- *Software for Calculating Upper Confidence Limits (UCLs) ProUCL Version 4.0* (EPA, 2009 [Online])
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment, Final)* (EPA, July 2004)
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment, Final)* (EPA, 2009a)
- *Guidelines for Ecological Risk Assessment* (EPA, 1998)

7.3 Constituents of Potential Concern

The COPCs are those constituents that are carried through the risk quantification process. This section summarizes those constituents detected in environmental media at the site and identifies the COPCs for media that are accessible for human or ecological exposures. During the course of the baseline risk assessment, the COPCs are evaluated to identify and prioritize which constituents, if any, are estimated to pose unacceptable risks and should be addressed in an FS.

7.3.1 Data Used in the Baseline Risk Assessment

The analytical data used in this risk assessment include data from sediment and soil samples collected during field investigations conducted in March through April 2010. Sampling for the RI included collection of samples from the same areas where the highest COPC concentrations were observed during the SI. Considering this, the RI data were determined to provide representative current and future exposure estimates, and data collected during the SI (collected in October 2008) were not included in the HHRA and ERA[17].

The specific samples used in this assessment included the following:

- 30 MI soil samples collected from 0 to 6 inches bgs at 10 DUs (consisting of 3 replicate MI samples per DU and 30 increments per MI sample),
- 12 soil samples collected from 0 to 2 inches following BIP (including 1 field duplicate),
- 23 discrete soil samples collected from 2 and 3 feet bgs (including 2 field duplicates), and

[17] SI sample data from outside the areas sampled during the RI were screened in the SI Report and found to be below HDOH EALs; therefore they were not included in this baseline risk assessment.

- 5 sediment samples collected from 0 to 6 inches bgs (including 1 field duplicate)

A summary of all the samples used in the baseline risk assessment is presented by receptor, area of interest, matrix, and date of collection in Table 7-1. Data obtained from the MRS during the RI were validated by a qualified chemist, and the results of the data validation are presented in the associated Data Quality Assessment Report (Appendix F). Before data evaluation, the data were processed to produce a "working" data set (such as, data adequate for statistical analysis and subsequent risk evaluation) with which to prepare the risk assessment. Data processing included resolving the following field duplicate results to produce a single value for each constituent at each sampling location:

- If there were two detections, the average of the two concentrations was used
- If there was one detection and one nondetection, the detected value was used
- If there were two nondetects, the lowest detection limit was used

7.3.2 Criteria for Selection of COPCs

In accordance with EPA guidance, factors considered in identifying COPCs for risk assessment purposes at the MRS were the following:

- Identification of detected constituents
- Background screening
- Availability of toxicity factors

COPCs were identified separately for each exposure medium (soil and sediment). Evaluation of the risk assessment data using these criteria is discussed in the following subsections. For the HHRA, COPCs were identified on a DU-specific basis, whereas for the ERA COPCs were identified on a site-wide basis.

Identification of Detected Constituents

As a conservative measure, all the constituents that were detected at least once in a particular exposure medium were carried to the following step in the COPC selection process. Constituents that were not detected in a particular exposure medium were not selected as COPCs for that medium.

Soil Data

The soil data used for this risk assessment were from both discrete sample locations and MI soil samples collected during the RI. Data from soil samples were assigned to each of the 10 DU from which they were sampled and evaluated collectively for each specific DU. Soil sample locations are identified on Figures 3-7 through 3-10. The specific samples used in this assessment included 65 soil samples, collected in March and April 2010. These data were used to assess the potential for risks from direct contact by humans and ecological receptors.

Sediment Data

Five sediment samples (including 1 field duplicate) collected on April 2010, from Waikane Stream adjacent and downstream of the MRS, were used for the risk assessment. Sediment sample locations are identified on Figure 3-10. Of the constituents analyzed for, 3 (cobalt, copper, and lead) were detected in sediment samples collected in the Waikane Stream. These data were used to assess the potential for risks from direct contact by humans and for ecological exposure scenarios.

Background Screening

Two background samples were collected at 2 feet bgs (WVIA-SS-019, in the vicinity of the site gate) and between 0 and 0.5 foot bgs (WVIA-SS-026, north of AOC-04). These samples were collected to determine site-specific background concentrations for metals data evaluation. As discussed in Section 4.0, background concentrations for metals in Koolau volcanic soil at Oahu Navy Facilities (Earth Tech, June 2006) were also considered in data evaluation as a larger and more statistically representative population. For the HHRA, DU-specific soil samples with concentrations below the background level were not considered as COPCs. For the ERA, site-wide soil samples with maximum concentrations below the background concentrations were not considered COPCs for the risk assessment.

Availability of Toxicity Factors

If a toxicity factor for a constituent was available from a reliable source (as defined in Section 7.5.3), the constituent was evaluated as a COPC. All constituents selected as COPCs had available toxicity factors although some did not for every exposure pathway.

7.3.3 Summary of COPCs Selected for Use in the Assessment

Tables 7-2 and 7-3 provide summaries of the COPCs selected for soil and sediment at the MRS by potential receptor, respectively. For soil, six analytes were identified as COPCs: TNT, 2-Amino-4,6-dinitrotoluene, 4-Amino-2,6-dinitrotoluene, antimony, copper, and lead. For sediment, three analytes were identified as COPCs: cobalt, copper, and lead. Since there were no available background data for sediment, all detected metals were included as COPCs for sediment. Background soil concentrations are considered, however, as a line of evidence in the interpretation of the ecological risk assessment results for sediment (see Section 7.6.6).

7.3.4 Exposure Point Concentrations

Exposure point concentrations (EPCs) are estimated constituent concentrations with which a receptor may come into contact, and are specific to each exposure medium. For direct contact routes of exposure to soil (incidental ingestion and dermal contact), EPCs are represented by concentrations directly measured in soil samples collected each area. For the inhalation route, EPCs were estimated using modeling approaches consistent with risk assessment guidance. Dust concentrations in ambient air were estimated using particulate emission factors (PEFs), derived as described in Section 7.5.2.

EPC Calculation Approach

For the HHRA, EPCs in soil were identified for each DU as the maximum detected concentration of copper and lead from the 3 MI sample results from within each DU, and the maximum concentrations from the discrete samples within each DU (all except copper and lead).

For the ERA, EPCs in soil were identified as the 95 percent UCL on the site-wide mean concentrations. For copper and lead, the MI results were used preferentially over the discrete results. The EPCs for ecological risk estimation were calculated by using the best statistical estimate of an upper bound on the average exposure concentrations, in accordance with EPA guidance for statistical analysis of monitoring data (EPA, 1989, 1992, 2002a). The 95 percent UCL is considered by these guidance documents as a conservative upper bound estimate that is not likely to underestimate the mean concentration and most likely overestimates that concentration. EPCs were calculated for each analyte using EPA's statistical program ProUCL, Version 4.00.04 (EPA, 2009b). This procedure identifies the statistical distribution type (that is, normal, lognormal, or non-parametric) for each constituent within the defined exposure area and computes the corresponding 95 percent UCL for the identified distribution type. The maximum detected concentration is used in place of the 95 percent UCL when the calculated 95 percent UCL is greater than the maximum detected value. Summary statistics and EPCs for COPCs in soil are summarized in Table 7-4.

For exposure pathways associated with sediment, EPCs were identified on a sample-specific basis (for example, maximum detected concentrations were used), rather than aggregating data spatially. This is because the sediment data set consists of only 4 sample locations and potential ecological exposures to sediment can be localized. The individual sample data for COPCs in sediment collected within Waikane Stream are provided in Table 7-3.

7.4 Exposure Conceptual Site Model

This section provides the Exposure CSM for the MRS and integrates what was already discussed in Section 4.3. This Exposure CSM provides a current understanding of the sources of contamination, physical setting, current and future land use, and identifies potentially complete human and ecological exposure pathways at the site. It addresses exposures that may result under current site conditions and from reasonably anticipated potential uses of the site and the surrounding areas in the future. Information generated during previous site investigations as described in Section 2.0 have also been considered to identify potential exposure scenarios at the MRS.

Descriptions of the physical setting, land uses, water beneficial uses, climate and ecological setting, and wildlife associated with the MRS have been provided in Section 2.0.

7.4.1 Exposure Pathway Analysis

This section describes the means by which receptors (people or animals) at or near the MRS may come into contact with constituents in exposure media. It addresses exposures that may result under current site conditions and from reasonably anticipated potential uses of the site and the surrounding areas in the future.

An exposure pathway can be described as the physical course that a COPC takes from the point of release to a receptor. Chemical intake or route of exposure is the means by which a COPC enters a receptor. For an exposure pathway to be complete, all of the following components must be present:

- A source
- A mechanism of chemical release and transport
- An environmental transport medium
- An exposure point
- An exposure route
- A receptor or exposed population

In the absence of any one of these components, an exposure pathway is considered incomplete and, by definition, there is no risk or hazard. Figure 4-5 depicts the CSM for the site.

Contaminant Sources and Release Mechanisms

The primary sources and release mechanisms for the MRS are those resulting from activities associated with jungle training and field maneuvers. The purpose of the risk assessment is to evaluate the residual constituents that have been associated with past military operations within the MRS, as well as those associated with MEC items that had been fired and were determined to be still fuzed and blown in place.

Potentially Complete Human Exposure Pathways and Receptors

Based on the current understanding of land and water use conditions at or near the MRS, the exposure pathways considered for HHRA include the following:

- Incidental ingestion and dermal contact with soil and sediment by future recreationalists, future construction workers, and hypothetical future residents

- Inhalation of ambient dust particles generated by wind or maintenance activities for future recreationalists, future construction workers, and hypothetical future residents

Because the site is a military non-operational range with restricted access, current human health exposure scenarios are limited. However, the future recreational scenario adequately addresses current possible trespassers that could be potentially exposed to contamination in soil and sediment.

In order to determine whether land use restrictions may be needed at the MRS, the hypothetical residential exposure scenario is the focus of this risk assessment. That is, if risk estimates under unrestricted land use assumptions are found to be lower than regulatory requirements, no land use controls would be deemed necessary to protect humans from risk posed by soil contamination (the HHRA and ERA do not consider hazards associated with MEC).

Potentially Complete Ecological Exposure Pathways and Receptors

On the basis of the current understanding of available habitat types and wildlife potentially using the MRS, and the beneficial uses in the vicinity of the site, the most plausible potentially complete ecological pathways include the following:

- Uptake of site-related chemicals via the food chain by higher trophic level receptors (for example, Hawaiian short-eared owl (*Asio flammeus sandwichensis*) or *Pueo*
- Direct contact with soil and sediment in areas containing suitable habitat for birds
- Direct uptake of site-related constituents from sediment by aquatic and benthic organisms

7.5 Human Health Risk Assessment

7.5.1 Tiered Approach

This HHRA was conducted using a tiered framework in accordance with Navy guidance (2006, 2008) and EPA guidance (EPA, 1989, 1992, 1997). This approach is structured to focus on the COPCs, receptors, and areas where the greatest potential for exposure would be expected. The process begins with a conservative screening of COPC concentrations with levels known to be protective of human health and the environment. This first tier, or Tier 1, was conducted during the SI and compared site data with screening EALs from HDOH. Based on the Tier 1 results, additional sampling and evaluation as a Tier 2 HHRA (baseline risk assessment) was determined to be necessary during the RI. The specific process used for the Tier 2 HHRA is described in the following sections.

7.5.2 Human Exposure Assessment

The exposure assessment component of the HHRA identifies the means by which individuals at or near the MRS may come into contact with constituents in exposure media. It addresses exposures that may result under current site conditions and from reasonably anticipated potential uses of the site and the surrounding areas in the future. The exposure assessment also identifies the populations that may be exposed, the routes by which individuals may become exposed, and the magnitude, frequency, and duration of potential exposures.

As described in Section 7.4.1, potential exposure scenarios considered for the HHRA include the following:

- **Hypothetical Future Residents:** Potential exposure of hypothetical future residents to chemicals in soil to 3 feet bgs by incidental ingestion, dermal contact, and inhalation of dust.
- **Future Construction Workers:** Potential exposure of future construction workers to chemicals in soil to 3 feet bgs by incidental ingestion, dermal contact, and inhalation of dust.
- **Future Recreational Users:** Potential exposure of future onsite recreational users to chemicals in soil to 3 feet bgs by incidental ingestion, dermal contact, and inhalation of dust. Potential exposure to chemicals in sediments of Waikane Stream by incidental ingestion and dermal contact.

The exposure assessment component of the HHRA for the MRS includes the following steps:

- Development of exposure assumptions for potentially complete exposure pathways
- Calculation of chemical intake for COPCs

The methodologies and results of these steps are discussed in the following subsections.

Human Exposure Assumptions

The estimation of exposure requires numerous assumptions to describe potential exposure situations. Upper-bound exposure assumptions are used to estimate "reasonable maximum exposure" (RME) conditions to provide a bounding estimate on exposure. The exposure assumptions used are specific to the identified exposure scenarios at the MRS. The scenarios evaluated were selected based on the conceptual site and exposure model (Section 7.4 and Figure 4-5) and are consistent with the reasonably anticipated future land uses.

The exposure parameters used for generating RME risk estimates are listed in Table 7-5. Most of the exposure assumptions for ingestion, dermal contact, and inhalation are provided by EPA guidance documents (listed in Section 7.2).

Intake Equations for Ingestion of Soil and Sediment

The following equations were used to calculate the intake (expressed as milligrams per kilogram per day [mg/kg-day]) associated with the incidental ingestion of carcinogenic and noncarcinogenic contaminants in soil and sediment under the future construction worker and future recreational user[18] exposure scenarios:

$$Intake = \frac{C_s \times IRS_a \times 10^{-6}\, kg/mg \times EF \times ED_a}{BW_a \times AT}$$

The following age-weighted equation was used to calculate the intake associated with the incidental ingestion of carcinogenic and noncarcinogenic contaminants in soil and sediment under a hypothetical future resident exposure scenario:

$$Intake = \frac{C_s \times IFS_{adj} \times EF \times 10^{-6}\, kg/mg}{AT}$$

where:

$$IFS_{adj} = \frac{ED_c \times IRS_c}{BW_c} + \frac{ED_a \times IRS_a}{BW_a}$$

where:

C_s = chemical concentration in soil and sediment (mg/kg)
IFS_{adj} = age-adjusted soil ingestion factor [(mg-year)/(kg-day)]

[18] The recreational user is conservatively assumed to be a 10 year-old child. See Table 7-5 for exposure factors for this scenario.

IRS_a = adult soil ingestion rate (mg/day)
IRS_c = child soil ingestion rate (mg/day)
EF = exposure frequency (days/year)
ED_a = adult exposure duration (years)
ED_c = child exposure duration (years)
BW_a = adult body weight (kg)
BW_c = child body weight (kg)
AT = averaging time (days)

The exposure assumptions for estimating chemical intake from the ingestion of contaminants in soil and sediment are presented in Table 7-3.

Intake Equations for Dermal Contact with Soil and Sediment

The following equations were used to calculate the intake from dermal contact with carcinogenic and noncarcinogenic contaminants in soil and sediment under the future construction worker and future recreational user exposure scenarios:

$$Intake = \frac{C_S \times ABS \times SA_a \times AF_a \times EF \times ED_a \times 10^{-6}\, kg/mg}{BW_a \times AT}$$

The following age-weighted equation was used to calculate the intake from dermal contact with carcinogenic and noncarcinogenic contaminants in soil and sediment under the hypothetical future resident exposure scenario:

$$Intake = \frac{C_S \times SFS_{adj} \times ABS \times EF \times 10^{-6}\, kg/mg}{AT}$$

where:

$$SFS_{adj} = \frac{ED_c \times AF_c \times SA_c}{BW_c} + \frac{ED_a \times AF_a \times SA_a}{BW_a}$$

where:

C_s = chemical concentration in soil and sediment (mg/kg)
ABS = fraction of contaminant absorbed dermally from soil (unitless)
SFS_{adj} = age-adjusted dermal contact factor [(mg-year)/(kg-day)]
SA_a = adult exposed skin surface area (square centimeters [cm^2])
SA_c = child exposed skin surface area (cm^2)
AF_a = adult soil-to-skin adherence factor (mg/cm^2)
AF_c = child soil-to-skin adherence factor (mg/cm^2)
EF = exposure frequency (days/year)
ED_a = adult exposure duration (years)
ED_c = child exposure duration (years)
BW_a = adult body weight (kg)
BW_c = child body weight (kg)
AT = averaging time (days)

The exposure assumptions for estimating exposure from dermal contact with soil and sediment are presented in Table 7-5. Dermal absorption factor values were obtained from the dermal assessment guidance (EPA, 2004). In accordance with EPA RAGS, Part E, there are no default dermal absorption values presented for inorganic classes of compounds, except for arsenic and cadmium.

Intake Equations for Inhalation of Ambient Dusts from Soil

The following equation was used to calculate the exposure concentrations of carcinogenic and noncarcinogenic contaminants associated with inhalation of ambient dust emissions from soil under the future construction worker, future recreational user and future resident exposure scenarios:

$$EC = \frac{C_s \times \left(\frac{1}{PEF}\right) \times EF \times ED \times ET}{AT}$$

where:

EC = inhalation exposure concentration (mg/m^3)
ET = exposure time (hours/day)
C_s = chemical concentration in soil (mg/kg)
EF = exposure frequency (days/year)
ED = exposure duration (years)
PEF = particulate emission factor (m^3/kg)
AT = averaging time (days)

The exposure assumptions used to estimate exposure from inhalation of dust and vapors in ambient air are presented in Table 7-5.

7.5.3 Human Toxicity Assessment

The toxicity assessment section of the HHRA identifies the types of toxic effects a chemical can exert. Chemicals were divided into two broad groups on the basis of their effects on human health: noncarcinogens and carcinogens. This classification has been selected because health risks are calculated quite differently for carcinogenic and noncarcinogenic effects, and separate toxicity values have been developed for them.

Carcinogens are those chemicals suspected of causing cancer following exposure; noncarcinogenic effects cover a wide variety of systemic effects, such as liver toxicity or developmental effects. Some chemicals (such as 2,4,6-trinitrotoluene) are capable of eliciting both carcinogenic and noncarcinogenic responses; therefore, these carcinogens are also evaluated for systemic (noncarcinogenic) effects.

Information considered to classify the likelihood that a chemical is a human carcinogen includes human studies of the association between cancer incidence and exposure, as well as long-term animal studies under controlled laboratory conditions. Other supporting evidence considered includes short-term tests for genotoxicity, metabolic and pharmacokinetic properties, toxicological effects other than cancer, structure-activity relationships, and physical and chemical properties of the chemical. For noncancer effects, toxicity values were derived on the basis of the critical toxic endpoint (that is, the most sensitive adverse effect following exposure). Carcinogens are classified by the EPA as known (Group A), probable (Groups B1 and B2), or possible (Group C) human carcinogens.

Reference Doses for Noncancer Effects

The toxicity value describing the dose-response relationship for noncancer effects is the reference dose value (RfD), or in the case of inhalation, the reference concentration, or RfC. For noncarcinogenic effects, the body's protective mechanisms must be overcome before an adverse effect is manifested. If exposure is high enough and these protective mechanisms (or thresholds) are exceeded, adverse health effects can occur. EPA attempts to identify the upper bound of this tolerance range in the development of noncancer toxicity values. EPA uses the apparent toxic threshold value, in conjunction with uncertainty factors based on the strength of the toxicological evidence, to derive an RfD or RfC. EPA defines an RfD (also applies to RfC) as follows (EPA, 1989):

> "In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The RfD is generally expressed in units of mg/kg of body weight each day (mg/kg-day)."

This HHRA uses available chronic RfDs and RfCs for the oral and inhalation exposure routes, respectively. Because EPA has not derived toxicity values specific to skin contact, dermal RfDs were derived in accordance with the EPA *Supplemental Guidance for Dermal Risk Assessment* (EPA, 2004). The RfD that reflects the absorbed dose was calculated by using the following equation:

$$RfD_{ABS} = RfD_o \times ABS_{GI}$$

where:

RfD_{ABS} = absorbed reference dose
RfD_o = oral reference dose
ABS_{GI} = gastrointestinal (GI) absorption efficiencies

GI absorption efficiencies were obtained from the *Supplemental Guidance for Dermal Risk Assessment* (EPA, 2004). In accordance with this guidance, dermal toxicity factors are only adjusted when the ABS_{GI} is less than 50 percent.

Slope Factors for Cancer Effects

The dose-response relationship for cancer effects is expressed as a cancer slope factor that converts estimated intake directly to excess lifetime cancer risk (ELCR). Slope factors are presented in units of risk per level of exposure (or intake). The data used for estimating the dose-response relationship are taken from lifetime animal studies or human occupational or epidemiological studies in which excess cancer risk has been associated with exposure to the chemical. However, because risk at low intake levels cannot be directly measured in animal or human epidemiological studies, a number of mathematical models and procedures have been developed to extrapolate from the high doses used in the studies to the low doses typically associated with environmental exposures. The model choice leads to uncertainty. EPA generally assumes linearity at low doses and uses the linearized multistage procedure when uncertainty exists about the mechanism of action of a carcinogen and when information suggesting nonlinearity is absent.

It is assumed, therefore, that if a cancer response occurs at the dose levels used in the studies, there is some probability that a response occurs at all lower exposure levels (that is, a dose-response relationship with no threshold is assumed). Moreover, the dose-response slope chosen is usually the UCL on the dose-response curve observed in the laboratory studies. As a result, uncertainty and conservatism are built into the EPA risk extrapolation approach. EPA has stated that cancer risks estimated by this method produce estimates that "provide a rough but plausible upper limit of risk." In other words, it is not likely that the true risk would be much more than the estimated risk, but "the true value of the risk is unknown and may be as low as zero" (EPA, 1986).

Because EPA has not derived toxicity values specific to skin contact, dermal slope factors were derived in accordance with the EPA *Supplemental Guidance for Dermal Risk Assessment* (EPA, 2004). The slope factor that reflects the absorbed dose was calculated by using the following equation:

$$SF_{ABS} = \frac{SF_o}{ABS_{GI}}$$

where:

SF_{ABS} = absorbed slope factor
SF_o = oral slope factor
ABS_{GI} = GI absorption efficiencies

GI absorption efficiencies were obtained from the *Supplemental Guidance for Dermal Risk Assessment* (EPA, 2004). In accordance with this guidance, dermal toxicity factors are only adjusted when the ABS_{GI} is less than 50 percent.

For the inhalation route, this HHRA uses the inhalation unit risk (IUR) to estimate risk in accordance with *Risk Assessment Guidance for Superfund–Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)* (EPA, 2009a). EPA defines an IUR as "the upper-bound ELCR estimated to result from continuous exposure to an agent at a concentration of 1 $\mu g/m^3$ in air" (EPA, 2008).

Source of Toxicity Values

In accordance with EPA guidance (2005), the toxicity values (cancer slope factors and noncancer reference doses) used were obtained from the following sources:

- The Integrated Risk Information System (IRIS) database available through the EPA Environmental Criteria and Assessments Office in Cincinnati, Ohio. IRIS, prepared and maintained by EPA, is an electronic database containing health risk and EPA regulatory information on specific chemicals.

- EPA Provisional Peer Reviewed Toxicity Values (PPRTVs), provided by the Office of Research and Development, National Center for Environmental Assessment, Superfund Health Risk Technical Support Center, which develops these values on a chemical-specific basis when requested under the EPA Superfund program.
- The Health Effects Assessment Summary Tables (HEAST), provided by the EPA Office of Solid Waste and Emergency Response (EPA, 1997), is a compilation of toxicity values published in various health effects documents issued by EPA.

The toxicity values used in the HHRA are listed in Table 7-6 and, following the above hierarchy, were obtained from EPA RSL tables (EPA, 2010).

7.5.4 Human Health Risk Characterization

This section summarizes the approach used to develop the human health risk estimates for the MRS and presents a quantitative risk characterization for soil and sediment based on the results obtained from the RI samples used in this risk assessment.

In the risk characterization component of the HHRA process, quantification of risk is accomplished by combining the results of the exposure assessment (estimated chemical intakes) with the results of the dose-response assessment (toxicity values identified in the toxicity assessment) to provide numerical estimates of potential health effects. The quantification approach differs for potential noncancer and cancer effects, as described in the subsections below.

Although this HHRA produces numerical estimates of risk, it should be recognized that these numbers might not predict actual health outcomes because they are based largely on hypothetical assumptions. Their purpose is to provide a frame of reference for risk management decision-making. Any actual risks are likely to be lower than these estimates. Interpretation of the risk estimates provided should consider the nature and weight of evidence supporting these estimates, as well as the magnitude of uncertainty surrounding them.

For the purposes of this evaluation, the potential for unacceptable human health risk is identified by using the following risk thresholds:

- In interpreting estimates of ELCRs, the EPA under the Superfund program and Navy HHRA guidance generally considers action to be warranted when the multi-chemical aggregate cancer risk for all exposure routes within a specific exposure scenario exceeds 1×10^{-4}. Action generally is not required for risks falling within 1×10^{-6} and 1×10^{-4}; however, this is judged on a case-by-case basis (EPA, 1991b).
- Under both EPA and state guidance, unacceptable noncancer hazard exists if the multi-chemical aggregate noncancer hazard for all exposure routes within a specific exposure scenario exceeds a target noncancer HI of 1.

- If lead concentrations in environmental media result in a predicted blood-lead level of 10 micrograms per deciliter (µg/dL) in greater than 5 percent of the potentially exposed population, lead is present at unacceptable levels. This corresponds to a soil concentration of 400 mg/kg for residential exposures and 800 mg/kg for worker exposures (HDOH, Summer 2008, updated March 2009).

Cancer Risk Estimation Method

The potential for cancer effects is evaluated by estimating ELCR. This risk is the incremental increase in the probability of developing cancer during one's lifetime in addition to the background probability of developing cancer (that is, if no exposure to MRS chemicals occurs). For example, an ELCR of 2×10^{-6} means that, for every 1 million people exposed to the carcinogen throughout their lifetimes, the average incidence of cancer may increase by two cases of cancer. In the United States, the background probability of developing cancer for men is a little less than one in two and for women is a little more than one in three (American Cancer Society, 2003). As previously mentioned, cancer slope factors developed by EPA represent upper-bound estimates; therefore, any cancer risks generated in this assessment should be regarded as an upper bound on the potential cancer risks rather than accurate representations of true cancer risk. The true cancer risk is likely to be less than that predicted (EPA, 1989). For the MRS, ELCR was estimated by using the following formula:

$$Risk = Intake \times SF$$

where:

Risk = ELCR (unitless probability)
Intake = chronic daily intake averaged over a lifetime (mg/kg-day)
SF = cancer slope factor $(\text{mg/kg-day})^{-1}$

Inhalation risk is calculated by multiplying intake by the IUR. The IUR is expressed in different units than the cancer slope factor (above), and a conversion factor is necessary to normalize units between the IUR and intake values. Inhalation risk is estimated by using the following formula:

$$Risk_{inh} = EC_{inh} \times IUR \times CF$$

where:

$Risk_{inh}$	=	ELCR from inhalation (unitless probability)
EC_{inh}	=	Inhalation exposure concentration averaged over lifetime (mg/m^3)
IUR	=	Inhalation unit risk $(\mu g/m^3)^{-1}$
CF	=	Conversion factor (µg/mg)

Although synergistic or antagonistic interactions might occur between cancer-causing chemicals and other chemicals, information is generally lacking in the toxicological literature to predict quantitatively the effects of these potential interactions. Therefore, cancer risks are treated as additive within an exposure route in this assessment. This approach is consistent with the EPA guidelines on chemical mixtures (EPA, 1986). For estimating the cancer risks from exposure to multiple carcinogens from a single exposure route, the following equation is used:

$$Risk_T = \sum_{1}^{N} Risk_i$$

where:

$Risk_T$ = total cancer risk from route of exposure
$Risk_i$ = cancer risk for the i^{th} chemical
N = number of chemicals

Noncancer Risk Estimation Method

For noncancer effects, the likelihood that a receptor will develop an adverse effect is estimated by comparing the predicted level of exposure for a particular chemical with the highest level of exposure that is considered protective (that is, its RfD). The ratio of the intake divided by RfD is termed the hazard quotient (HQ):

$$HQ = {Intake}/{RfD}$$

where:

HQ = noncancer hazard quotient from route of exposure
Intake = chronic daily intake averaged over the exposure duration (mg/kg-day)
RfD = noncancer reference dose (mg/kg-day)

For noncancer effects by inhalation exposure, the following equation is used:

$$HQ_{inh} = {EC_{inh}}/{RfC}$$

where:

HQ_{inh} = Noncancer hazard quotient from inhalation
EC_{inh} = Inhalation exposure concentration averaged over the exposure duration (mg/m^3)
RfC = Noncancer reference concentration (mg/m^3)

When the HQ for a chemical exceeds one (that is, exposure exceeds RfD or RfC), there is a concern for potential noncancer health effects. To assess the potential for noncancer effects posed by exposure to multiple chemicals, an HI approach was used according to EPA guidance (1989a). This approach assumes that the noncancer hazard associated with exposure to more than one chemical is additive; therefore, synergistic or antagonistic interactions between chemicals are not accounted for. The HI may exceed 1.0 even if all the individual HQs are less than 1. In this case, the chemicals may be segregated by similar mechanisms of toxicity and toxicological effects. Separate HIs may then be derived based on mechanism and effect. The HI is calculated as follows:

$$HI = \frac{Intake_1}{RfD_1} + \frac{Intake_2}{RfD_2} + \ldots \frac{Intake_i}{RfD_i}$$

where:

HI = hazard index
$Intake_i$ = daily intake of the i^{th} chemical (mg/kg-day)
RfD_i = reference dose of the i^{th} chemical (mg/kg-day)

Both intake and RfD are expressed in the same units (mg/kg-day) and represent the same exposure period (that is, chronic exposure).

Risk Estimation Method for Lead

The EPCs for lead in soil were compared to the EPA RSLs. Concentrations of lead in soil were compared to the residential and industrial RSLs of 400 and 800 mg/kg, respectively. If concentrations exceeded these criteria at relevant exposure points, lead is retained as a contaminant of concern.

7.5.5 Summary of Risk Estimates by Exposure Scenario

This subsection summarizes the risk estimates for each of the exposure scenarios identified for the MRS. As described on the CSM, the exposure scenarios for the MRS are as follows:

- Hypothetical future residential scenario
- Future construction worker scenario
- Future recreational user scenario

The cancer and noncancer risk estimates for soil for each decision unit, and for sediment, are summarized by exposure scenario in the following subsections. The risk calculation data sheets used to develop the risk estimates for each exposure scenario described below are provided by scenario in Appendix K.

Hypothetical Future Residential Scenario

Potential exposures to soil were evaluated under this scenario. Potential routes of exposure to COPCs in soil include incidental ingestion, dermal contact, and inhalation of ambient dusts. The future resident was assumed to be exposed for 350 days per year over a duration of 30 years (for the first 6 years as a 15-kg child, followed by 24 years as a 70-kg adult).

A total of 65 soil samples were used for the residential scenario risk evaluation. The samples used for the residential scenario are listed in Table 7-1, and the DU-specific concentrations for soil are provided in Table 7-2. As a conservative approach, the maximum detect COPC concentrations for each DU exposure unit were used to evaluate potential exposure to soil for the hypothetical future residential exposure scenario.

The HI and ELCR estimates for the future residential exposure scenario are summarized in Table 7-7. The estimated DU-specific HIs for non-carcinogenic chemicals in soil samples range from not detected to a maximum of 0.9 at DU-7, which are below the regulatory threshold value of 1. The estimated DU-specific ELCRs from all carcinogenic chemicals in soil samples ranges from not detected to a maximum of 2×10^{-8}, which is below the regulatory target risk range of 1×10^{-6} to 1×10^{-4}.

The maximum concentration of lead in soil (140 mg/kg in MI sample at DU-6) for this exposure scenario does not exceed the residential RSL value of 400 mg/kg.

Future Construction Worker Scenario

Potential exposures to soil were evaluated under this scenario. Potential routes of exposure to COPCs in soil include incidental ingestion, dermal contact, and inhalation of ambient dusts. The future construction worker was assumed to be a 70-kg adult exposed to soil anywhere across the MRS for 20 days per year (4 work weeks) over a duration of 6.6 years (mean work tenure, according to EPA [1997c]).

A total of 65 soil samples were used for the construction worker scenario risk evaluation. The samples used for the construction worker scenario are listed in Table 7-1, and the DU-specific concentrations for soil are provided in Table 7-2. As a conservative approach, the maximum detect COPC concentrations for each DU exposure unit were used to evaluate potential exposure to soil for the construction worker exposure scenario.

The HI and ELCR estimates for the future construction worker exposure scenario are summarized in Table 7-7. The estimated DU-specific HIs for non-carcinogenic chemicals in soil samples range from not detected to a maximum of 0.07 at DU-7, which are below the regulatory threshold value of 1. The estimated DU-specific ELCRs from all carcinogenic chemicals in soil samples ranges from not detected to a maximum of 3×10^{-10}, which is below the regulatory target risk range of 1×10^{-6} to 1×10^{-4}.

The maximum concentration of lead in soil (140 mg/kg in MI sample at DU-6) for this exposure scenario does not exceed the occupations RSL value of 800 mg/kg.

Future Recreational User Scenario

Potential exposures to soil and sediment were evaluated separately under this scenario. Potential routes of exposure to COPCs in soil include incidental ingestion, dermal contact, and inhalation of ambient dusts. Potential routes of exposure to COPCs in sediment include incidental ingestion and dermal contact. The future recreational user was assumed to be a 36-kg juvenile exposed to soil anywhere across the MRS for 52 days per year (1 day per week for 52 weeks per year) over a duration of 5 years (using professional judgment).

A total of 65 soil samples and 5 sediment samples were used for the recreational user scenario risk evaluation. The samples used for the recreational user scenario are listed in Table 7-1, and the DU-specific concentrations for soil are provided in Table 7-2. As a conservative approach, the maximum detect COPC concentrations for each DU exposure unit were used to evaluate potential exposure to soil for the recreational user exposure scenario.

The HI and ELCR estimates for the future recreational exposure scenario are summarized in Table 7-7 for soil exposure and Table 7-8 for sediment exposure. The estimated DU-specific HIs for noncarcinogenic chemicals in soil samples range from not detected to a maximum of 0.2 at DU-7, which are below the regulatory threshold value of 1. The estimated DU-specific ELCRs from all carcinogenic chemicals in soil samples ranges from not detected to a maximum of 1×10^{-9}, which is below the regulatory target risk range of 1×10^{-6} to 1×10^{-4}.

For sediment, the estimated HI was 0.1, below the regulatory threshold value of 1. No ELCR was computed since no carcinogenic COPCs were detected in sediment.

The maximum concentration of lead in soil (140 mg/kg in MI sample at DU-6) and sediment (4 mg/kg in sample at WVIA-S-002) for this exposure scenario does not exceed the residential RSL value of 400 mg/kg.

7.5.6 Conclusions from the HHRA

This HHRA was conducted in accordance with EPA, HDOH, and Navy risk assessment guidance. Risks were estimated for the most plausible pathways of human exposure, based on reasonably anticipated land uses at the WTVA. These exposure scenarios evaluated included hypothetical future residential, future construction worker, and future recreational user receptor groups.

For each exposure scenario, a conservative approach was used to select exposure concentrations, by assuming exposure occurs to the maximum detected chemical concentrations across each decision unit. This approach is conservative because it assumes that concomitant exposure to maximum levels occurs even though maximum levels are not necessarily collocated within a decision unit. The HHRA results for these three exposure scenarios, summarized in Table 7-7, indicate that the HIs for noncarcinogenic chemicals in soil and sediment are below the regulatory threshold value of 1. The ELCR estimates are below the EPA target risk range of 1×10^{-6} to 1×10^{-4}. Therefore based on the available analytical data, no unacceptable risk is identified for these scenarios.

7.6 Ecological Risk Assessment

This section provides the results of the ERA for soil and sediment samples collected at the Waikane Valley MRS. The objective of this ERA was to determine the nature, magnitude, and probability of actual or potential harm to the environment posed by the threatened or actual release of hazardous substances at or from the MRS to soil and sediment from the adjacent Waikane Stream. This ERA was conducted using a tiered framework consistent with U.S. Department of Navy (Navy, 2003) and EPA guidance (EPA 1997, 1998), and is consistent with the objectives and requirements of Step 3a of Tier 2 (Baseline Ecological Risk Assessment, or BERA) of the Navy's overall tiered process. The results of Tier 1 (Screening Risk Assessment, or SRA) were provided in Section 3.0 of the Site Inspection (SI) Report.

7.6.1 Selection of Ecological Assessment Endpoints

Assessment endpoints define the environmental characteristics of actual value that, if found to be substantially affected, indicate a need for remediation (for example, the survival and health of avian species using the MRS). For the MRS, assessment endpoints are based on the habitat types that occur within the locality of the project site. The selection of assessment endpoints depends on (EPA, 1997):

- contaminants present and their concentrations
- mechanisms of toxicity of the contaminants to different groups of organisms
- ecologically relevant receptor groups that are potentially sensitive or highly exposed to the contaminant and attributes of their natural history

- potentially complete exposure pathways

As an example, the ecological health of Hawaiian short-eared owl (*Asio flammeus sandwichensis*) or *Pueo* is considered a significant assessment endpoint because *Pueo* may occur in the terrestrial habitat areas and forage on small mammals and birds at the MRS, are highly valued, and are susceptible to exposure and toxicity from contaminants occurring there. An appropriate assessment endpoint for the MRS would be the survival and health of terrestrial birds, as represented by the Hawaiian short-eared owl. This assessment endpoint meets the criteria listed above and is considered a primary endpoint for this ERA.

7.6.2 Measures of Exposure and Effect

Assessment endpoints often cannot be directly measured because they tend to correspond to complex ecosystem attributes. Because of this, the ERA identifies other related measures that serve as representations or surrogates of each assessment endpoint. These measures are called "measures of effect" and "measures of exposure" (EPA, 1998). The strength of the relationships between these measures and their corresponding assessment endpoints is critical to the identification of ecological adversity. For this ERA, these measures are defined as follows:

- Measures of exposure are quantitative or qualitative indicators of the occurrence and movement of a contaminant in the environment in a way that results in contact with the assessment endpoint. For this ERA, chemical concentrations measured in soil and modeled to prey tissue serve as direct measures of exposure via the food web to wildlife users of the MRS (as represented by the Hawaiian short-eared owl).
- Measures of effect are measurable adverse changes in an attribute of an assessment endpoint (or its surrogate) in response to a chemical to which it is exposed. For this ERA, literature-derived critical toxicity values from available laboratory studies on birds are used to indicate when the Hawaiian short-eared owl may be adversely affected.

The assessment endpoints identified for the MRS, and the corresponding measures of exposure and effect, are summarized in Table 7-9.

7.6.3 Selection of Representative Endpoint Species

To facilitate quantitative evaluation of potential exposures and effects associated with constituent stressors and assessment endpoints, wildlife are identified that are considered representative of indigenous wildlife functional groups at a site. The endpoint species should preferably be one that has ecological relevance, is of social value, is susceptible to constituent stressors, and allows risk managers to meet policy goals. These four factors collectively describe the ecological value of the species selected, as well as the functional groups they represent. Another consideration in the selection of endpoint species is the availability of literature-based exposure parameters such as body weight. A short description of the species chosen to represent the potentially exposed wildlife is presented below.

Hawaiian Short-Eared Owl

The *Draft Environmental Assessment (EA) for the Proposed United States Marine Corps (USMC) Jungle Warfare Training Waikane Valley, Oahu, Hawaii* (MCBH, September 2004) noted that the endemic Hawaiian short-eared owl (*Asio flammeus sandwichensis*) or *Pueo* was not detected during surveys but may occasionally use resources present within the site, especially in the more open *'uluhe* dominated higher elevations of the valley wall. *Pueo* primarily feed on small rodents and occasionally on small birds and invertebrates. *Pueo* grow between 12 and 17 inches in size and are most active during dawn and dusk. *Pueo* are highly regarded by Hawaiians as a guardian spirit and a good omen. The Hawaiian short-eared owl was selected as a representative of terrestrial wildlife, particularly raptors and other owls, that may use the site because they are potential users (that is, foragers) of the habitat in the locality of the MRS, are highly valued by the society, and would be expected to have a high exposure to site-related constituents. The *Pueo* is considered a species of concern in the State of Hawaii. Since the *Pueo* would be expected to experience a high-end exposure to site-related constituents because of its position in the food web, risk assessment of this receptor would be anticipated to provide a conservative representation of other birds using the site.

Sediment Infauna

For Waikane Stream, sediment infauna (such as freshwater benthic macroinvertebrates) as a group represents the endpoint species.

7.6.4 Tier 2 ERA Methods and Results

This ERA uses exposure estimates for receptors specific to the site to characterize risks, for those chemicals identified as COPCs (see Section 7.3 and Tables 7-2 and 7-3). The methodology and results for this ERA are provided in the following subsections.

Estimation of Exposure to Avian Wildlife

Wildlife experience chemical exposure through multiple pathways, including ingestion of abiotic media (surface water and sediment/soil) and biotic media (food), as well as inhalation and dermal contact. To assess this multiple pathway exposure, modeling can be/or is often employed. The end product, or exposure estimate, for wildlife is a dosage (amount of chemical in milligrams per kilogram receptor body weight per day [mg/kg-day]) rather than a media concentration, as is the case for the other receptors. This is a function of both the multiple pathway approach and the typical methods used in toxicity testing. The general form of the model used to estimate exposure of wildlife to chemicals in environmental media is as follows (Suter et al. 2000):

$$E_t = E_o + E_d + E_i$$

Where, E_t is the total chemical exposure experienced by wildlife, and E_o, E_d, and E_i are oral, dermal, and inhalation exposures, respectively. Oral exposure occurs through the consumption of contaminated food, water, or sediment/soil. Dermal exposure occurs when contaminants are absorbed directly through the skin, and inhalation exposure occurs when volatile compounds or fine particulates are inhaled into the lungs. Although methods are available for assessing dermal exposure to humans (*Dermal exposure assessment: principles and applications*, EPA/600/8-91/011B), data necessary to estimate dermal exposure generally are not available for wildlife (*Wildlife Exposure Factors Handbook. Vol. I*, EPA-600-R-93-187a). Similarly, methods and data necessary to estimate wildlife inhalation exposures are poorly developed. Dermal exposure is likely to be low, even in burrow-dwelling animals, because of the presence of protective dermal layers (such as feathers, fur, or scales). Additionally, a wildlife receptor's exposure to contaminants by inhalation and dermal contact usually contributes little to its overall exposure. Therefore, this ERA assumes that both dermal and inhalation exposure is negligible.

According to the conceptual exposure model, the most feasible means through which the *Pueo* may be exposed to site COPCs is through direct ingestion of surface soil and food-chain transfer of chemicals via ingestion of prey items (that is, small mammals and/or birds). Quantitative exposure estimates for the *Pueo* are developed using food-web modeling procedures consistent with EPA guidance (EPA, 1993). These models use best available information for predicting the ability and extent of the movement of a chemical through the food chain with ultimate uptake into an endpoint species. In addition, the food web models consider concomitant chemical intake from soil incidentally ingested with food items and during preening or foraging activities.

For evaluating exposure to avian species through a food chain, the equation used to estimate chemical-specific intake is as follows:

$$I_{diet} = [C_s \times DIR_f \times AUF \times ((BAF_m \times Frac_m) + (Frac_s))]/BW$$

Where:

I_{diet} = Dietary exposure rate (mg/kg body weight-day)
C_s = Chemical concentration in soil (mg/kg dry weight)
DIR_f = Daily food ingestion rate (kg/day dry weight)
AUF = Area use factor (unitless)
BAF_m = Bioaccumulation factor for small mammals and birds (unitless)
$Frac_m$ = Fraction of diet represented by small mammals and birds (unitless)
$Frac_s$ = Fraction of diet represented by soil (unitless)
BW = Body weight of wildlife receptor (kg)

Wildlife Exposure Parameters

As can be seen from the intake equation, to estimate avian exposure from surface soil and prey, media concentration data are needed, as well as exposure parameters that are specific to the endpoint species. EPCs that serve as input to the intake equations (designated as C_s in the equation) were estimated by aggregating concentration data from soil samples collected from across the project site. The EPCs for aggregate risk estimation were calculated by using the best statistical estimate of an upper bound on the average exposure concentrations, in accordance with EPA guidance for statistical analysis of monitoring data (EPA, 2002), as described in Section 7.3.4. Summary statistics and UCLs for all detected soil constituents are provided in Table 7-2.

The species-specific exposure parameters used for this ERA include body weight, food intake rate, diet composition, percent of diet as soil, and area-use factor. The exposure parameters and references used for the Hawaiian short-eared owl (*Pueo*) are summarized in

Table 7-10. All weight-based exposure parameters are listed on a dry-weight basis. For this ERA, a body weight of 0.348 kg for the owl was used in the food-web model (Illinois Natural History Service [INHS], 2010). The fraction of diet represented by each food item is obtained by evaluating the entire diet of the representative species; Hawaiian short-eared owls almost exclusively forage on small mammals and birds. Biological information was unavailable for *Pueo* food ingestion rate. An allometric equation (EPA, 1993) was used to approximate the daily food ingestion rate. The allometric conversion for food ingestion is discussed below.

The area-use factor (AUF) represents the percentage of time the representative species is likely to forage in the study area. There are no available studies documenting the home range for the *Pueo* in Hawaii, but the site-specific home range size is expected to be indirectly related to prey availability. As previously noted, the EA indicated that the *Pueo* was not detected during surveys but may occasionally use resources present within the site, especially in the more open *'uluhe* dominated higher elevations of the valley wall. Because the lower portions of the site are densely vegetated/forested (most predatory birds such as owls prefer to hunt/forage in more open settings), a conservative assumption was made that *Pueo* could receive as much as 50 percent of their forage from the MRS. Therefore an AUF of 0.5 was used in the food-web exposure model for the *Pueo*. The numerical results of exposure quantification for the *Pueo* are provided in Table 7-11.

Allometric Conversions for Food Intake Rate

Allometric equations provided in EPA (1993) are used to estimate daily food ingestion rates (in kg/day) for the *Pueo* as follows:

$$\textit{Non-passerine birds (kg/day)} = (0.301 * BW^{0.751})/1000$$

Where:

BW = Body weight (g)

Using this equation for the *Pueo* with a body weight of 0.348 kg, the daily food intake rate is estimated to be 0.136 kg/day (dry weight basis).

Estimation of Bioaccumulation into Food Items

Bioaccumulation can be defined as the uptake and accumulation of chemicals by organisms from the nonliving (abiotic) environment and through the diet. The concentration of a site-related chemical in a food chain item is not always available, but often must be estimated. For the purposes of exposure estimation, partitioning of chemicals from soil to prey items is estimated from literature values (for example, small mammal bioaccumulation factors). *Pueo* almost exclusively forage on small mammals and birds. The bioaccumulation models were selected from the following sources:

- For Metals: *Development and Validation of Bioaccumulation Models for Small Mammals* (Sample et. al., 1998) - dry-weight small mammal BAFs and regression models
- For Explosives: *Methodology for Predicting Cattle Biotransfer Factors* (Research Triangle Institute [RTI], September 2005)

Chemical-specific bioaccumulation factors used to estimate chemical concentrations in prey items are provided in Table 7-12.

Sediment Infauna Exposure

For sediments in Waikane Stream, benthic organisms are assumed to be potential receptors for site-related COPCs. Exposure estimation for these organisms is not made by estimating daily chemical intake, as for wildlife receptors. Rather, because benthic receptors are directly exposed to constituents in the media in which they live, and because toxicity values for these taxa are expressed in terms of media concentrations, site media concentrations were directly compared with levels believed to be nontoxic to relevant species. The sediment concentration results for exposure quantification for benthic organisms are provided in Table 7-13.

7.6.5 Ecological Effects Assessment

The ecological effects assessment identifies the toxicological properties associated with the chemical stressors at the MRS. It determines the type of effect that could result to the ecosystem if exposure is excessive, and identifies which benchmarks provide a measure of the potential for ecological effects.

Measures of Effects for Avian Wildlife

The toxicity of chemicals to avian wildlife as a result of potential exposure to contaminated media at the MRS is identified by using literature-derived critical toxicity values. A literature review of the toxicological properties for site chemicals was conducted to identify the highest exposure level considered to be without adverse ecological impact. This exposure level is called the toxicity reference value (TRV). TRVs were derived by interpreting existing literature-derived toxicological studies and adjusting the data, if necessary, to obtain values that are expected to protect the selected endpoint species. When necessary, literature references citing use of laboratory animals that have similar sensitivity, life history, or habitat requirements are used as surrogates for the wild ecological receptor species. Additionally, a few munitions-related constituents that were detected do not have adequate toxicity information to quantify ecological risks. These are addressed in the uncertainties section. In some cases, data for surrogate chemicals (for example, 2,4-dinitrotoluene for 2-amino-4,6-dinitrotoluene and 4-amino-2,6-dinitrotoluene) were used.

For the *Pueo*, the primary toxicological endpoint used for development of the TRV is the chronic no observed adverse effects level (NOAEL). Because ecological populations are the primary focus of this ERA, population-type endpoints such as reproduction or survival are of greatest concern. NOAELs are obtained from studies using animal species that are as closely related as possible to the selected endpoints species (for example, with similar dietary habits), and the exposure route and duration are similar to those feasible at the project site.

Derivation of wildlife TRVs for the Hawaiian short-eared owl is a three-step process:

1. Conduct a literature search to compile toxicity data for the COPCs using surrogate (that is, laboratory test) avian species

2. Review these toxicity data to select the most appropriate values (that is, considering exposure duration and route) for each COPC or chemical surrogate
3. Use uncertainty factors (UF) from the toxicology literature to derive a chronic NOAEL from other less sensitive endpoints (that is, sub-chronic lowest observed adverse effect level [LOAEL]), if necessary

Toxicological Uncertainty Factors

Uncertainty factors are applied to the literature-derived toxic level to account for any differences in the reported effect level and exposure duration. For example, if a chronic NOAEL is unavailable and only the chronic LOAEL is reported, an uncertainty factor of 5 (that is, LOAEL/5) is applied to derive the NOAEL used to calculate the TRV. The following uncertainty factors are used in deriving chronic NOAELs for TRVs (Wentsel et al., 1996):

- Chronic NOAEL to Chronic NOAEL = 1
- Chronic LOAEL to Chronic NOAEL = 5
- Subchronic NOAEL to Chronic NOAEL = 10

The selected literature-derived toxic level, uncertainty factors applied, and the TRVs derived for each COPC are provided in Table 7-14.

Wildlife Toxicity Data Sources

Sources used for ecological toxicity information include:

- EPA Ecological Soil Screening Levels (http://www.epa.gov/ecotox/ecossl/)
- U.S. Army Wildlife TRVs for Ecological Risk Assessments (http://chppm-www.apgea.army.mil/erawg/tox/index.htm)

Measures of Effects for Sediment Infauna

The potential for adverse effects on freshwater benthic organisms in the Waikane Stream was evaluated by comparing chemical concentrations detected in surface sediment with benthic macroinvertebrate screening benchmarks. This ERA uses the following freshwater sediment benchmarks to evaluate the likelihood of effects to invertebrate communities in the Waikane Stream [obtained from National Oceanic and Atmospheric Administration's (NOAA) *Screening Quick Reference Tables* (Buchman, 2008)]:

- Threshold effect concentrations (TECs) and Probable effect concentrations (PECs)

The primary literature source for TECs/PECs is the *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems* (MacDonald et al., 2000) which used multiple benchmarks to develop consensus screening values. TECs are generally defined as levels below which effects are not expected. PECs are generally defined as levels above which significant adverse effects to benthic resources could be expected. Measured levels between the TEC and PEC indicate that some species may be adversely impacted.

7.6.6 Ecological Risk Characterization

The purpose of the ecological risk characterization is to evaluate the evidence linking site contaminants with potential adverse ecological effects. This link is established by combining the ecological exposure assessment and ecological effects assessment through quantitative or qualitative evaluations, or both. It should be noted that the avian wildlife risk estimates for this ERA included the following added measures of conservatism: 1) incidental soil ingestion is not included as part of the total dietary composition, but instead is added to the total; 2) bioavailability of chemical constituents are assumed to be equivalent to the chemical form used in the toxicity studies; and 3) risk estimates were calculated for using NOAELs. The uncertainties associated with the evaluations are presented in Section 7.7.

Ecological Risk Quantification Method for Avian Wildlife

The primary means for quantifying ecological risk for avian species at the MRS is to determine the ratio of the estimated chemical exposure level for the endpoint species of concern with the chemical-specific TRV:

$$Ecological\ \ HQ = I/TRV$$

where:

HQ	= Ecological hazard quotient (unitless)
I	= Chemical intake level (mg/kg body weight-day)
TRV	= Toxicity reference value (mg/kg body weight-day)

This ratio is called the ecological HQ. When the HQ exceeds unity, there is a potential for ecological risk. When a cumulative effect from potential exposure to more than one chemical is suspected or known, an ecological HI is calculated. An ecological HI is a measure of the potential for adverse effects due to multiple COPCs and applies to COPCs that act by the same toxicological mechanism. An ecological HI is the sum of all hazard quotients for chemicals with similar toxicological mechanisms and is calculated as follows:

$$HI = HQ_1 + HQ_2 + ... + HQ_i$$

where:

HI	= Ecological hazard index (unitless)
HQ_i	= Ecological hazard quotient for the i^{th} constituent (unitless)

For the COPCs identified at the MRS, this ERA calculates an HI for all organic munitions-related compounds, but the HQ estimates for antimony, copper, and lead are considered toxicologically distinct.

Risk Characterization Results for Avian Wildlife

Ecological HQs were derived for the MRS by comparing the calculated chemical intake of constituents detected in soil collected in 2010 for the RI with TRVs identified to be protective of the Hawaiian short-eared owl (*Pueo*). Exposure was assumed to occur to COPCs in soil and prey items collectively. The results of the HQ and HI estimates for the MRS are provided in Table 7-11.

A total of 65 soil samples were used for this ERA. Of the 6 COPCs identified (see Section 7.3 and Table 7-2), only copper concentrations resulted in an ecological NOAEL-based HQ exceeding 1.0 for the *Pueo*, with a HQ of 1.3. The ecological significance of this copper exceedance is discussed further in the following section. Considering the aggregate ecological risk calculated for toxicologically-similar munitions-related compounds, the HI is 0.02, well below the regulatory limit of 1.0.

Evaluation of Potential Ecological Significance

The *Pueo* risk estimates using conservative assumptions resulted in a NOAEL-based HQ for copper that slightly exceed 1.0. This section discusses the ecological significance of this exceedance by providing additional evaluation using the following two considerations to refine the risk estimates:

- First, a consideration is made of the range between the NOAEL and LOAEL, because actual chemical-specific toxicity is expected to fall somewhere between these two.
- Second, risk was estimated excluding one MI replicate sample from DU-7 (WVIA-M-029), which appears to be an outlier.

Consideration of Effects Data for Copper

The risk estimates in this ERA used NOAELs to develop TRVs (the highest tested dose shown to be without adverse effects). For copper, a NOAEL of 4.05 mg/kg-day (for reproductive effects to chickens) obtained from EPA EcoSSLs (EPA, 2007) was used, which resulted in a HQ of 1.3. The LOAEL from the study EPA selected was reported to be 12.1 mg/kg-day (al Ankari et al, 1998). Using this LOAEL, the copper HQ for the *Pueo* would be 0.4. The 12.1 mg/kg-day LOAEL is the lowest bounded LOAEL reported by EPA (2007) for studies evaluating mortality and/or reproductive endpoints.

Consideration of a Potential Outlier

One multi-incremental replicate sample (of three) collected from DU-7 had a reported copper level of 5,000 mg/kg, which was over an order of magnitude higher (approximately 14 times higher) than copper levels found in any of the 29 additional samples collected at the MRS. The corresponding replicate samples at DU-7 were 350 and 250 mg/kg. Considering the high variability with relative to the other two replicates within DU-7 and throughout the MRS, the result may be an outlier. It is unknown whether the anomalous value resulted from a piece of copper metal in this replicate. To help bound the uncertainty from inclusion of this sample result, a 95 percent UCL was re-calculated using ProUCL (following methodology described in Section 7.3.4) excluding the result for sample WVIA-M-029. The resulting EPC for copper is 205 mg/kg, considerably lower than the previous UCL of 1,006 mg/kg. Using the re-calculated EPC, the revised NOAEL-based HQ is 0.3, below the regulatory target of 1.

Risk Characterization Results for Sediment Infauna

Benthic invertebrates represent endpoint species of concern because they serve as a food source for upper-trophic-level species that use Waikane Stream and adjacent riparian areas. Potential effects on benthic communities are assessed using an approach that considers collective lines of evidence. The lines of evidence evaluated to identify the potential for risks to infaunal resources are summarized below.

Lines of Evidence for Freshwater Sediment Infauna

- Identification of constituent concentrations in sediment that exceed effects-based screening benchmarks (e.g., TEC and PEC screening levels)
- Comparison of constituent concentrations detected in sediment with background concentrations

Surface sediment concentrations from 5 sediment samples (including 1 duplicate sample) collected in Waikane Stream during March 2010 were used to assess the potential risk to freshwater sediment infaunal communities. Copper concentrations (ranging from 95 to 110 mg/kg) at each sample location exceed the TEC, however do not exceed PEC benchmarks. The maximum concentrations for all other COPCs are below both the TEC and PEC screening benchmarks. Copper levels detected throughout the reach were uniform (such as low variability) and are below the reported background Koolau volcanic soil level of 183 mg/kg (Earth Tech, June 2006). This suggests that the levels of copper found in Waikane Stream can be attributable to background. Considering these factors, risks to sediment infauna in Waikane Stream are believed to be low.

7.6.7 Ecological Risk Assessment Conclusions

This ERA was conducted consistent with methodology recommended in HDOH, Navy, and EPA guidance, focusing on site-related constituents, receptors, and areas where the greatest potential for ecological exposure might be expected. Specifically, this ERA is consistent with the objectives and requirements of Step 3a of Tier 2 (Baseline Ecological Risk Assessment, or BERA) of the Navy's overall tiered process (Navy, February 2003). The resulting characterization is expected to provide sufficient information for informed risk management decisions at the MRS. As such, the results here are key for consideration by risk managers during the scientific management decision point (SMDP), as outlined in the Navy and EPA tiered process.

The primary decision for which the results of the ERA provide input is whether additional actions are necessary at the site to reduce the potential threat of ecological risk. Based on the nature and extent of constituent concentrations observed during the RI, and considering current and reasonably anticipated future habitat conditions, risks posed to ecological receptors are within acceptable levels. This conclusion was drawn based on the results of the risk characterization for avian receptors which, with consideration of toxicity data and the potential outlier, indicate that risk to the Hawaiian short-eared owl is *de minimis*. Additionally, levels of potentially site-related COPCs in sediment samples collected at the adjacent Waikane Stream were determined to be below levels harmful to the aquatic/benthic community.

7.7 Uncertainties and Assumptions

Full characterization of human health and ecological risks requires that the numerical estimates of risk presented in the risk assessments be accompanied by a discussion of the uncertainties inherent in the assumptions used to estimate those risks. Uncertainties in risk assessment methods may result either in understating or in overstating the risks. The latter is likely the case when health-conservative assumptions are used to characterize risk. Several sources of uncertainty can affect the overall estimates of human and ecological health presented in this assessment. The sources are generally associated with the following:

- Sampling, analysis, and data evaluation
- Chemical fate and transport estimation
- Exposure assessment
- Toxicity assessment
- Risk estimation

These sources of uncertainty are discussed in the following subsections.

7.7.1 Uncertainties Associated With Sampling, Analysis, and Data Evaluation

Uncertainties associated with sampling and analyses include the inherent variability (standard error) in the analysis, the representativeness of the samples, sampling errors, and heterogeneity of the sample matrix. The quality assurance and quality control program used during the various investigations serves to maintain acceptable precision and accuracy in measurement of chemical concentrations, but it cannot eliminate all errors associated with sampling and analysis.

The degree to which sample collection and analyses reflect real exposure concentrations will influence the reliability of the risk estimates. Because of the site investigations have generally focused on sampling close to suspected source areas, rather than at areas where exposure are most likely, exposure point concentrations used for the risk estimates are likely biased high for some receptors.

To evaluate the nature and extent of potential metal contamination in surface soil at the site, the MI sampling approach was used to maximize sample representativeness. As indicated in Table 4-2, RSD values (from three replicates) above 50 percent were found at some DUs, indicating that the mean concentration is not representative of the specific DU possibly because of a highly heterogeneous soil and/or distribution of compounds of interest. To address the uncertainty associated with the variability observed, the maximum concentrations of each compound from the three replicate samples were conservatively used for evaluating contaminant nature and extent at all DUs and evaluating site-specific risk.

Although one intention of MI sampling is to derive an aerially-integrated concentration for specific DUs, in some instances outliers can result when significant heterogeneity exists. The variable replicate results at DU-3, DU-7, and DU-9, although somewhat elevated, are within typical statistical ranges for sampling and analysis variability given the possible soil heterogeneity in these DUs. This heterogeneity may be attributed to deposition of silty clay soils and weathered basalt rock material eroded from the higher elevations to the north of the DUs. Higher copper concentrations appear to correspond to areas where relatively higher density of MPPEH and MEC items were found during surface clearance and intrusive investigations. The uncertainty surrounding the anomalously high copper sample is reflected in the ecological HQ estimates both including (HQ=1.3) and excluding (HQ=0.3) this sample.

7.7.2 Uncertainties Associated With Chemical Fate and Transport Estimation

This risk assessments made simplifying assumptions about the environmental fate and transport of COPCs; specifically, that no chemical loss or transformation has occurred since the sampling data were collected, or will occur during the future. In cases for which natural attenuation or other degradation processes are moderate or high, the analytical data chosen to represent exposure concentrations likely overstate actual long-term exposure levels. This uncertainty is likely to be more relevant for organic chemicals that biodegrade (for example, explosives) than for those that are persistent in the environmental (for example, metals).

7.7.3 Uncertainties Associated with Exposure Assessment

The estimation of exposure in this risk assessments required many assumptions. There are uncertainties regarding the likelihood of exposure, the frequency of contact with contaminated media, the concentrations of chemicals at exposure points, and the total duration of exposure. The human exposure assumptions used in the risk estimates are intended to be conservative and likely overestimate the actual risk or hazard. Future residential use of the MRS is not likely due to the generally steep terrain. The HHRA assumes that the future recreational scenario also adequately addresses current or future possible trespassers that could be potentially exposed to contamination in soil and sediment. The exposure assumptions for recreational users assume that a 10-year old juvenile (i.e., old enough to ride a bike) gains access to the site once per week, year round for 5 years. These assumptions are also considered reasonable for assessing trespassers.

Another uncertainty for the risk assessment is the bioavailability of the forms of metals that occur in soil and sediment at the MRS. The HHRA and ERA conservatively assume that bioavailability from soil/sediment is the same as that in the toxicological studies from which the toxicity values were derived. Generally the chemical form used in the toxicological studies is more water-soluble and thus more bioavailable than the forms found in typical soil. If the chemical form at the site is less bioavailable than assumed, actual risk would be proportionately lower.

In accordance with EPA’s dermal assessment guidance (EPA, 2004), this HHRA assumes that metals are not absorbed dermally. If the forms of metals present in soil are in fact absorbed to some degree, then exposures and risks would be proportionally higher than reported.

Noncancer hazards for hypothetical residents were estimated using an age-weighted methodology consistent with *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual* (Part B) (December 1991). If the more conservative child-only exposure assumptions that are used (for screening purposes) by EPA to derive RSLs were to be used, the residential hazard index estimates would be higher than reported here. Because the site is a military non-operational range with restricted access, human health exposure scenarios are very limited and the exposure assumptions used are considered appropriate. The majority of the acreage within Waikane Valley consists of inaccessible terrain that cannot be developed.

7.7.4 Uncertainties Associated With Toxicity Assessment

Uncertainties in toxicological data can also influence the reliability of risk management decisions. The toxicity values used for quantifying risk in this risk assessment have varying levels of confidence that may affect the confidence in the resulting risk estimates. The general sources of toxicological uncertainty include the following:

- Extrapolation of dose-response data derived from high dose exposures to adverse health effects that may occur at the low levels seen in the environment
- Extrapolation of dose-response data derived from short-term tests to predict effects of chronic exposures
- Extrapolation of dose-response data derived from animal studies to predict effects on humans
- Extrapolation of dose-response data from homogeneous populations to predict effects on the general population

The levels of uncertainty associated with the RfDs and RfCs for the COPCs (as judged by EPA) are expressed as uncertainty factors and modifying factors, and are provided in IRIS or HEAST. For chemicals suspected of resulting in cancer effects, uncertainty is in part expressed in terms of the EPA weight-of-evidence classification.

Other specific areas of toxicological uncertainty associated with the risk assessments are as follows:

- The HHRA used available chronic RfDs for the oral exposure route. This approach may represent a conservative measure for the construction worker and recreational user exposure scenarios, because it is most likely that any exposure would be intermittent and of shorter than lifetime duration.
- Toxicity values were not available for all chemicals detected; therefore, a surrogate toxicity factor for a structurally similar chemical was used. For example, 2,4-dinitrotoluene was used as a surrogate for other dinitrotoluenes in the ERA. If a structurally similar compound could not be identified, it was not carried forward into the risk assessment.
- Dermal exposures are different from oral exposures because not all of a chemical that comes into contact with a person's skin travels across the various layers of epidermal tissue, as indicated by a skin permeability factor, and because the toxic effects produced from this route of exposure may not be the same as when the chemical is ingested. In lieu of available toxicity values for the dermal route, this HHRA uses oral toxicity values to estimate the effects of dermally available chemicals. This approach may result in an underestimate or an overestimate of

risks, depending on whether a chemical is more or less toxic by the dermal route versus by ingestion.

- The toxicity reference values used for the ecological risk estimates are based on NOAELs. However, actual toxicity is expected within the range between a NOAEL and the lowest bounded LOAEL.

7.7.5 Uncertainties Associated with Risk Characterization

The potential for the development of noncancer adverse effects was estimated as the sum of the HQs for exposure to each individual contaminant. This approach, in accordance with EPA guidance, did not account for the possibility that chemicals act synergistically or antagonistically. Because some chemicals detected in site media occur naturally, it is important when interpreting risks to consider the relative level of potential risk posed by naturally occurring levels.

In order to determine whether land use restrictions may be needed at the MRS, the hypothetical residential exposure scenario is the focus of this risk assessment. That is, if risk estimates under unrestricted land use assumptions are found to be lower than regulatory requirements, no land use controls would be deemed necessary to protect humans from risk posed by soil contamination (the HHRA and ERA do not consider hazards associated with MEC). No unacceptable risk was seen for the hypothetical residential scenario.

This space is intentionally left blank.

This page is intentionally left blank.

8.0 Summary of Findings and Recommendations

RI activities were conducted at the MRS to augment data collected during the SI, estimate the distribution of MEC, evaluate the nature and extent of MC contamination, and assess potential risks to human and ecological receptors. RI Fieldwork was conducted between March and May 2010 and included surface clearance, soil and sediment sampling, MEC intrusive investigation, and geophysical and land surveying. Soil and sediment sample laboratory analyses were conducted to determine metal and explosive compound concentrations. Analytical results were compared against project-specific EALs to estimate potentially contaminated areas and conduct an EHE. A MEC hazard analysis and a baseline risk assessment were also conducted to evaluate the potential risks to human and ecological receptors. Section 8.1 summarizes the RI findings and Section 8.2 presents the recommendations for MRS.

8.1 Summary of Findings

Activities and main findings of the RI activities conducted in 2010 at the MRS are summarized below:

MEC Activities

- The area of the MRS with slopes of 30 degrees or less was estimated at approximately 36 acres. Accessible areas (that is, slope of 30 degrees or less) within the four target AOCs (AOCs 01, 02, 03, and 04) were surface cleared using a hand-held analog detector (Schonstedt GA52Cx magnetometer). Approximately 11 acres were cleared.
- All accessible areas south of the four target AOCs were surveyed during the SI and RI, covering a total of 2.92 acres of transects. No MEC or MPPEH were found within this area, except for three items found during the SI leaning against the fence or a tree near the access road, resting above the vegetation and soil, and pointing in a direction incompatible with impact from the firing area. The three items are assumed to have been carried out from the north side of the stream by trespassers. They were removed during the RI. Additionally, no MEC, MPPEH, or MDAS was observed during the RI daily activities, such as: trenching operations, composite sediment sampling of the entire length of the Waikane Stream within the MRS, field teams ingress and egress from target AOCs on a daily basis, or while the QC technicians walked through the entire site determining locations of slopes of 30 degrees or less.
- It has been determined that analog geophysics (rather than DGM) is the best tool to use at the MRS because operators can more easily gain access to the site

(analog magnetometer are easily hand-carried), vegetation removal is minimized, and site coverage is more complete.

- No MEC or MPPEH were found within AOC-01. MDAS were limited to expended small arms projectiles found immediately east of the AOC-01.
- Two MEC and one MPPEH items, and approximately 793 pounds of MDAS were found in AOC-02.
- Fifteen MEC and 90 MPPEH items, and approximately 3,547 pounds of MDAS were found within AOC-03.
- Eight MEC and approximately 290 pounds of MDAS were found within AOC-04.
- A total of 25 grids (each grid approximately 1/16 acre in area) and five transects (total length of 296 feet) were intrusively investigated down to 4 feet bgs to evaluate the density and vertical extent of MEC within the AOCs. Intrusive operations resulted in one MPPEH and one MEC recovered in AOC-03 and AOC-04, respectively, at a depth of 1 foot bgs. An additional 455 pounds of MDAS was also found during intrusive operations.
- MEC and MPPEH items were mainly concentrated in an area of approximately 40 acres to include AOCs 02, 03, and 04. This area is characterized by steep slopes, erosion, and various degrees of vegetation densities. Over the years, stormwater runoff may have caused limited migration of MEC to lower levels, but no evidence of MEC was observed within or near the stream by UXO technicians during collection of composite stream sediment samples.
- All MEC and MPPEH items containing explosives found during surface clearance and intrusive operations were explosively disposed of in place, vented during consolidation shots, and demilitarized as necessary. Fifteen demolition shots were conducted and generated a total of 1,085 pounds of MDAS.
- MDAS generated within the MRS was extracted and transported to the processing area using a helicopter with sling loading technique. Twelve extraction lifts were conducted.
- The MDAS were containerized in 55-gallon drums for off-site disposal. Fifteen drums, for a total of 8,080 pounds of MDAS, were shipped to Timberline Environmental Services in California, where they were confirmed demilitarized and smelted in accordance with guidelines provided in DoD 4160.20-M-1.

MC Activities

- Sample analytical results were evaluated against project-specific EALs. Soil samples were compared to HDOH direct exposure EALs, the May 2010 EPA residential RSL, and the Koolau Volcanic Soil background levels. Sediment samples were compared to the NOAA Sediment Quality Guidelines and the 2004 EPA Region III BTAG Freshwater Sediment Screening Benchmarks.

- MI Surface Soil Sampling (0-0.5 foot bgs)
  - MI sampling activities were conducted at AOCs 01 through 04, over 10 DUs. Three replicate samples were collected at each DU (total of 30 MI samples) between 0 and 0.5 foot bgs. Samples were analyzed for copper and lead.
  - Concentrations of copper above the site-specific EAL of 630 mg/kg and the background level of 183 mg/kg were detected in DU-7 (the topographically lowest and southern most part of AOC-03), where 5,000 mg/kg of copper were detected in one of the MI replicate samples. This was the only exceedance detected for copper during MI sampling at the MRS. The other two replicate samples collected within the same DU were both below the site-specific EAL. Higher copper concentrations appear to correspond to areas where relatively higher density of MPPEH and MEC items were found during surface clearance and intrusive investigations.
- BIP Surface Soil Sampling (0-2 inches bgs)
  - A total of 23 pre- and post-BIP soil samples (including three QA/QC samples) were collected at BIP locations between 0 and 2 inches bgs. Samples were analyzed for moisture content, metals, and explosive compounds nitroaromatics and nitroamines.
  - Concentrations of antimony and copper above the site specific EALs (6.3 mg/kg and 630 mg/kg respectively) and the background levels (6.9 mg/kg and 183 mg/kg, respectively) were found at some BIP locations. TNT was also found above the site-specific EAL of 7.2 mg/kg at one BIP location. Relatively higher concentrations were found in the pre-BIP samples for antimony and TNT, and in the post-BIP samples for copper.
  - Because the pre-BIP samples contained relatively high concentrations of antimony, which were comparable to the post-BIP sample results, antimony in soil is most likely due to past small arms firing activities and no negative impact is associated with BIP activities.
  - The explosion created by blowing the MEC items in place may have released some copper at two BIP locations.
  - Relatively high concentrations of TNT detected at one BIP location could be due to past firing activities conducted at the MRS.
- Subsurface Soil Sampling (0.5-3 feet bgs)
  - A total of 25 subsurface soil samples (including two background and two QA/QC samples) were collected at 10 locations within AOC-01 through AOC-04. Two samples were collected at each location at 2 and 3 feet bgs and analyzed for metals.
  - Concentrations in subsurface soil are all below the project-specific EALs.

- Sediment Sampling
  - Five sediment samples (including QA/QC samples) were collected between 0 and 0.5 foot bgs, within three sections of Waikane Stream. Samples were analyzed for moisture content, metals, and the explosive compound RDX.
  - Copper was detected above the NOAA LEL-based screening criteria (16 mg/kg) in four out of four samples, with concentrations that are consistent along the three sections of the stream, ranging between 95 mg/kg and 110 mg/kg.
  - Potential contamination of sediments could be associated with copper-contaminated soil particles transported by run-off water from the southern portions of the AOCs, where the highest concentrations of copper in surface soil were found, to the stream sediments.
  - Concentrations of copper in sediment were below the Koolau volcanic soil background levels.

Environmental Hazard Evaluation

- Groundwater is not a pathway of concern at the MRS.
- The only potential MC hazard at the site is associated with human direct exposure to antimony, copper, and TNT concentrations in surface soil above the direct exposure EAL. The volume of soil with a potential direct exposure hazards is 7,420 CY.

Munitions and Explosive of Concerns Hazard Assessment

- Based on MEC risks identified during the SI and RI investigations, the number and configuration of AOCs is revised. The WVIA MRS now consists of three AOCs (Southern Area, Target Area, and Non-Target Area) as shown in Figure ES-13.
  - The Southern Area (34 acres) is believed to be free of MEC items.
  - The Target Area, which covers approximately 47 acres across the original AOCs 02 through 04, was found during the SI and RI to contain the main concentration of MEC items during previous investigations as well as the RI. The Target Area was classified as high potential explosive hazard area (hazard level 2) for current and future land uses and as moderate potential explosive hazard area (hazard level 3) if surface or surface/subsurface clearance alternatives are proposed.
  - The Non-Target Area (approximately 106 acres) has slopes generally greater than 30 degrees, making them less accessible by human receptors, and appears to contain few MEC items (as assessed during the SI). The Non-Target Area was classified as moderate potential explosive hazard area (hazard level 3) for current and future land uses and as low potential explosive hazard area (hazard level 4) if surface or surface/subsurface clearance alternatives are proposed.

Human Health Risk Assessment

- Hypothetical future residential scenario
  - The estimated HIs for non-carcinogenic chemicals in soil samples range from not detected to a maximum of 0.9 at DU-7, below the regulatory threshold value of 1.
  - The ELCRs from all carcinogenic chemicals in soil samples were estimated up to a maximum of 2 x 10-8, below the regulatory target risk range of 1 x 10-6 to 1 x 10-4.
  - The maximum concentration of lead in soil (140 mg/kg in MI sample at DU-6) for this exposure scenario does not exceed the residential RSL value of 400 mg/kg.
- Future construction worker exposure scenario
  - The estimated HIs for noncarcinogenic chemicals in soil samples range from not detected to a maximum of 0.07 at DU-7, below the regulatory threshold value of 1.
  - The ELCRs from all carcinogenic chemicals in soil samples were estimated up to a maximum of 3 x 10-10, below the regulatory target risk range of 1 x 10-6 to 1 x 10-4.
  - The maximum concentration of lead in soil (140 mg/kg in MI sample at DU-6) for this exposure scenario does not exceed the occupational RSL value of 800 mg/kg.
- Future recreational exposure scenario
  - The estimated HIs for noncarcinogenic chemicals in soil samples range from not detected to a maximum of 0.2 at DU-7, below the regulatory threshold value of 1.
  - The ELCRs from all carcinogenic chemicals in soil samples were estimated up to a maximum of 1 x 10-9, below the regulatory target risk range of 1 x 10-6 to 1 x 10-4.
  - For sediment, the estimated HI was 0.1, below the regulatory threshold value of 1. No ELCR was computed since no carcinogenic COPCs were detected in sediment.
  - The maximum concentration of lead in soil (140 mg/kg in MI sample at DU-6) and sediment (4 mg/kg in sample at WVIA-S-002) for this exposure scenario does not exceed the residential RSL value of 400 mg/kg.
- It is therefore concluded that the potential risks posed to human receptors at the MRS are within acceptable levels for unrestricted future land use.

Ecological Risk Assessment

- Avian Wildlife
  - Copper concentrations resulted in an ecological NOAEL-based (4.05 mg/kg-day [for reproductive effects to chickens]) HQ for the *Pueo* of 1.3, slightly above the regulatory target of 1.0.
    - Using the LOAEL of 12.1 mg/kg-day (reported in the study EPA selected – Per al Ankari et al. (1998), the copper HQ for the *Pueo* would be 0.4, below the target level of 1.
    - Using an EPC of 205 mg/kg (calculated excluding the outlier copper concentration of 5,000 mg/kg from DU-7), the revised NOAEL-based HQ is 0.3, below the regulatory target of 1.
  - Considering the aggregate ecological risk calculated for toxicologically-similar munitions-related compounds, the HI is 0.02, well below the regulatory limit of 1.0.
- Aquatic/Benthic Life
  - Copper concentrations (ranging from 95 to 110 mg/kg) at each sample location exceed the TEC, but not the PEC benchmarks.
- It is therefore concluded that the risks posed to ecological receptors at the MRS are within acceptable levels.

8.2 Recommendations

Based on the 2008 SI and 2010 RI findings summarized above, no unacceptable risk to human and ecological receptors is currently present at the MRS due to MC in soil or sediment. However, MEC hazards must be addressed for all portions of the MRS. For feasibility study (FS) purposes, the MRS is characterized as three AOCs as shown on Figure 8-1. Response alternatives are recommended below for each of the AOCs, and the potential future land uses allowed by Department of Defense as a result of these actions are also provided.

Southern Area

An FS should be conducted considering DoD-EPA UXO Management Principles to evaluate the appropriate response action to be implemented in the 34-acre area located in the southernmost part of the site (south of the division line shown in Figure 8-1). This area has been extensively assessed during the SI and RI investigations, surveying all accessible areas (covering a total of 2.92 acres of transects). No evidence of MEC or MPPEH was observed during transects or other activities, except for three items assumed to have been carried out from the north side of the stream by trespassers. The three items were removed during the RI. The following response action alternatives should be analyzed for the FS:

- No Action. Under this alternative, the current fence remains in place and no land transfer is accomplished.
- Land use controls (LUCs). The LUC alternative includes removing the existing fence, providing signage and deed restrictions, and considers construction support if intrusive activities are planned. No land transfer would be allowed under this alternative.
- Surface clearance with LUCs. The surface clearance considers 100% clearance of MEC from the ground surface in the Southern Area. This alternative could result in land transfer which is restricted to light agricultural or recreational use. Construction support would be required for any planned excavations.
- Surface and subsurface clearance with LUCs. This alternative involves 100% surface and subsurface clearance of MEC from all accessible areas within the Southern Area. Land transfer for possible residential use is possible under this alternative, although construction support would be required for excavations. Maximum depth of clearance is recommended at 2 feet, since the RI subsurface investigations showed that no excavations for MEC exceeded the 2-foot depth.

Target Area

An FS should be conducted to evaluate the most-cost effective response actions to be implemented in the 47-acre area located in the northern part of the site to address the moderate to high explosive hazards. The following alternative response actions should be considered in the FS:

- No Action. Under this alternative, the current fence remains in place and no land transfer is accomplished.
- LUCs. The LUC alternative includes signage and fencing around the Target Area to separate it from the Southern Area and the Non-Target Area. Land transfer would not be accomplished under this alternative.
- LUCs with construction support. This alternative includes signage and deed restrictions, and considers construction support if intrusive activities are planned. No land transfer would be allowed under this alternative.
- Surface clearance (of accessible land) with LUCs. The surface clearance considers clearance of MEC from the ground surface that is reachable without exposing the remediation workers to undue slip, trip, or fall hazards. Since it is probable that not all MEC would be found due to the rough terrain, residual MEC risk would remain on the surface. However, land transfer is possible under this alternative, although it would be restricted to light agricultural or recreational uses. Construction support would be required for any planned excavations.
- Surface and subsurface clearance (of accessible land) with LUCs. This alternative involves surface and subsurface clearance of MEC from all accessible areas within the Target Area. Since it is probable that not all MEC would be found due to the rough terrain, land transfer would be possible only for light agricultural or recreational use, and construction support would be required for excavations. Maximum depth of clearance is recommended at 2 feet, since the RI subsurface investigations showed that no excavations for MEC exceeded the 2-foot depth.

- Surface and subsurface clearance of known Cultural Sites, with LUCs. This alternative considers 100% surface and subsurface clearance of the known cultural sites in the Target Area, along with access lanes. The only two sites affected by this alternative are the Kamaka Family Shrine and the Waikane Spring. Again, if land transfer were possible, it would be restricted to light agricultural or recreational use.

Non-Target Area

An FS should be conducted to evaluate the most-cost effective response actions to be implemented in the 106-acre Non-Target Area located in the northern part of the site to address the moderate explosive hazards. The following alternative response actions should be considered in the FS:

- No Action. Under this alternative, the current fence remains in place and no land transfer is accomplished.
- LUCs. The LUC alternative includes signage and fencing to separate the Non-Target Area from the Southern Area only. Land transfer would not be accomplished under this alternative.
- LUCs with construction support. This alternative includes signage and deed restrictions, and considers construction support if intrusive activities are planned. No land transfer would be allowed under this alternative.
- Surface clearance (of accessible land) with LUCs. The surface clearance considers clearance of MEC from the ground surface that is reachable without exposing the remediation workers to undue slip, trip, or fall hazards. Since it is probable that not all MEC would be found due to the rough terrain, residual MEC risk would remain on the surface. However, land transfer is possible under this alternative, although it would be restricted to light agricultural or recreational uses. Construction support would be required for any planned excavations.
- Surface and subsurface clearance (of accessible land) with LUCs. This alternative involves surface and subsurface clearance of MEC from all accessible areas within the Target Area. Since it is probable that not all MEC would be found due to the rough terrain, land transfer would be possible only for light agricultural or recreational use, and construction support would be required for excavations. Maximum depth of clearance is recommended at 2 feet, since the RI subsurface investigations showed that no excavations for MEC exceeded the 2-foot depth.

This space is intentionally left blank.

9.0 References

AECOS Consultants. September 2003. *Biological resources report for a proposed Marine Corps Jungle Warfare Training Area in Waikane Valley on windward Oahu.*

al Ankari, A., Najib, H., and al Hozab, A. 1998. Yolk and Serum Cholesterol and Production Traits, as Affected by Incorporating a Supraoptimal Amount of Copper in the Diet of the Leghorn Hen. Br. Poult. Sci. 39(3): 393-397. Ref ID: 2006.

Agency for Toxic Substances & Disease Registry (ATSDR). September 2004. *Toxicological Profile for Copper*.

Agency for Toxic Substances & Disease Registry (ATSDR). June 1995. *Toxicological Profile for 2,4,6-Trinitrotoluene.*

Agency for Toxic Substances & Disease Registry (ATSDR). September 1992. *Toxicology Profile for Antimony and Compounds.*

American Cancer Society. 2003. *Cancer Facts and Figures - 2003.* Atlanta, Georgia. http://www.cancer.org.

Belt Collins & Associates, July 1990. *Final Environmental Assessment for Fencing/Warning Signs and Demolition Work for FY87 MCON Project P-106, Land Acquisition, Waikane, Oahu, Hawaii.*

CH2M HILL. 2009. *Ecological Risk Evaluation for Waikane Valley Training Area, Kaneohe, O'ahu, Hawaii*. Prepared for NAVFAC Pacific, USA Environmental, Inc.

City and County of Honolulu. August 2000. Development and Sustainable Communities Plan (Map A-2; Section 1: Kahaluu). Published by Department of Planning and Permitting of the City & County of Honolulu. Buchman, M.F. 2008. *NOAA Screening Quick Reference Tables*. NOAA OR&R Report 08-1, Seattle, WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 34 pages.

Drigot, Diane C., Brian A. Wilcox, and Kristin N. Duin. November 2001. *Marine Corps Base Hawaii Integrated Natural Resources Management Plan/Environmental Assessment (MCBH INRMP/EA) (2002-2006)*. Prepared for Commanding Officer Marine Corps Base Hawaii.

Earth Tech. June 2006. *Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities*, Pacific Division, Naval Facilities Engineering Command.

Illinois Natural History Service (INSH). 2010. Short-eared owl (*Asio flammeus*) [online]. http://www.inhs.uiuc.edu/animals_plants/birds/ifwis/birds/short-eared-owl.html

MacDonald, D, C.G. Ingersoll and T.A. Berger. 2000. "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems." *Archives Environmental Contamination and Toxicology*. 39:20-31.

Marine Corps Base Hawaii (MCBH). September 2004. *Draft Environmental Assessment (EA) for the Proposed United States Marine Corps (USMC) Jungle Warfare Training Waikane Valley, Oahu, Hawaii.*

National Academy of Sciences. 1989. *Recommended Dietary Allowances.*

Research Triangle Institute (RTI). September 2005. Methodology for Predicting Cattle Biotransfer Factors. Prepared for U.S. Environmental Protection Agency by RTI International. EPA Contract Number: 68-W-03-42. Research Triangle Park, NC.

Sample, B.E., J. J. Beauchamp, R. A. Efroymson, G. W. Suter, II. February 1998. *Development and Validation of Bioaccumulation Models for Small Mammals*. Oak Ridge National Laboratory, U.S. Department of Energy. ES/ER/TM-119.

State of Hawaii Department of Health (HDOH). June 21, 2009. *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan.* HDOH Environmental Management Division, Honolulu, Hawaii.

State of Hawaii Department of Health (HDOH). Summer 2008, updated March 2009. *Screening for Environmental Hazards at Sites with Contaminated Soil and Groundwater.* HDOH Environmental Management Division, Honolulu, Hawaii.

Tuggle, H.D. and Bruce A. Wilcox. October 1998. *Strategic Integrated Resources Management Planning for Selected Properties of Marine Corps Base Hawaii: Camp H.M. Smith, Puuloa Training Facility, and a Portion of Waikane Valley.*

U.S. Army Corps of Engineers. 2005. *Wildlife Toxicity Reference Values (TRVs) for Ecological Risk Assessments*. Online at http://chppm-www.apgea.army.mil/erawg/tox/index.htm

U.S. Army Engineering and Support Center, Huntsville. 2006. *Draft Engineering Evaluation/Cost Analysis (EE/CA) Report, Former Waikane Valley Training Area, Island of Oahu, Hawaii.*

USEAP, Department of Defense, and Department of Interior. October 2008. *Munitions and Explosives of Concern Hazard Assessment Methodology - Interim*

U.S. Department of Navy (Navy). 2010. *Guidance for Conducting Ecological Risk Assessments*

U.S. Department of Navy (Navy). 2008. *U.S. Navy Human Health Risk Assessment Guidance*

U.S. Department of Navy (Navy). February 2003. *Navy Guidance for Conducting Ecological Risk Assessments*. U.S. Environmental Protection Agency (EPA). 2010. *Integrated Risk Information system (IRIS)*. EPA online database. Office of Research and Development. Cincinnati, Ohio.

U.S. Environmental Protection Agency (EPA). 2009b. *Software for Calculating Upper Confidence Limits (UCLs) ProUCL Version 4.00.04* [Online] http://www.epa.gov/nerlesd1/tsc/form.htm

U.S. Environmental Protection Agency (EPA). 2005 and 2007. *Ecological Soil Screening Level (EcoSSL) Reports:* for Copper and Lead . Office of Research and Development.

U.S. Environmental Protection Agency (EPA). 2005. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). OSWER Directive 92857-55. 2005 update to November, 2003.

U.S. Environmental Protection Agency (EPA). 2005a. *Guidelines for Carcinogen Risk Assessment.* EPA/630/P-03/001B.

U.S. Environmental Protection Agency (EPA). 2004. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim*. EPA/540/R/99/005.

U.S. Environmental Protection Agency (EPA). 2003 through 2008. *Ecological Soil Screening Levels.* Office of Solid Waste and Emergency Response. OSWER Directive 9285.7.

U.S. Environmental Protection Agency (EPA). December 5, 2003. *Memorandum – Human Health Toxicity Values in Superfund Risk Assessments*. OSWER Directive 9285.7-53.

U.S. Environmental Protection Agency (EPA). 2002. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites.*

U.S. Environmental Protection Agency (EPA). 1998. *Guidelines for Ecological Risk Assessment*. EPA/630-R-95/002F.

U.S. Environmental Protection Agency (EPA). 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*. EPA 540-R-97-006. Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1997b. *Health Effects Assessment Summary Tables (HEAST).* Provided by the EPA Office of solid Waste and emergency Response (OSWER), is a compilation of toxicity values published in various health effects documents.

U.S. Environmental Protection Agency (EPA). 1997c. *Exposure Factors Handbook Volume I. General Factors*. Office of Research and Development. EPA/600/P-95/002Fa. August 1997.

U.S. Environmental Protection Agency (EPA). 1996. *Soil Screening Guidance: User's Guide. Second Edition.* Publication 9355.4-23.

U.S. Environmental Protection Agency (EPA). December 1993. *Wildlife Exposure Factors Handbook.* Office of Research and Development. EPA/600/R-93/187b. December 1993.

U.S. Environmental Protection Agency (EPA). 1992. *Framework for Ecological Risk Assessment.* EPA/630/R-92/001.

U.S. Environmental Protection Agency (EPA). September 1991 through January 1996. ECO Updates. Office of Solid Waste and Emergency Response.

U.S. Environmental Protection Agency (EPA). March 25, 1991. *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors*. OSWER Directive No. 9285.6-03.

U.S. Environmental Protection Agency (EPA). 1989a. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final (RAGS).* EPA/540-1-89/002.

U.S. Environmental Protection Agency (EPA). 1989b. *Risk Assessment Guidance for Superfund Volume II, Environmental Evaluation Manual*. EPA/540/1-88/001.USA Environmental, Inc. (USAE). February 2010. *Final Work Plan, Munitions Response Sites, Waikane Valley Impact Area, Kaneohe, Hawaii.*

USA Environmental, Inc. (USAE). September 2009. *Site Inspection Report, Munitions Response Program, Waikane Valley Impact Area, Kaneohe, Hawaii.*

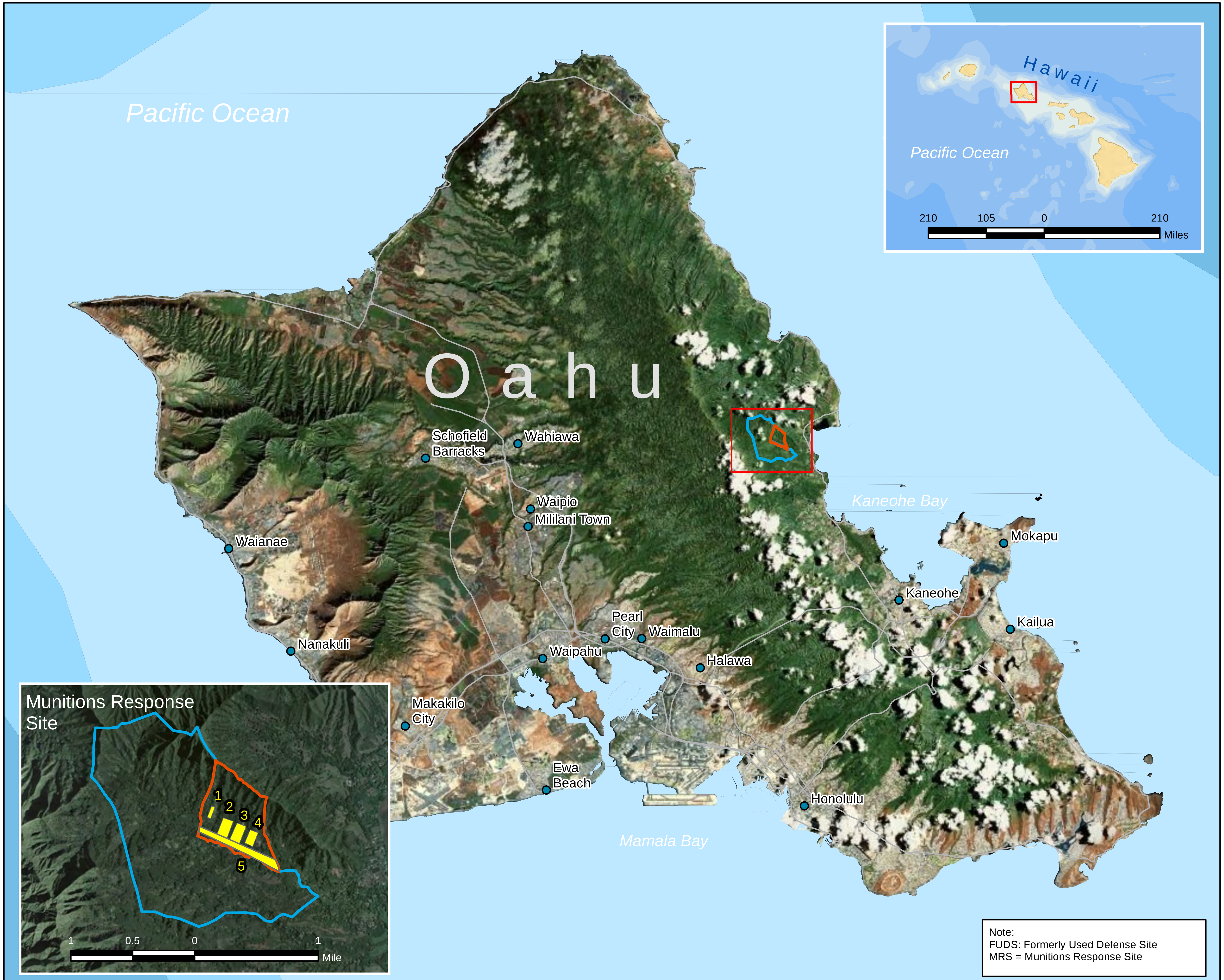
U.S. Department of Agriculture, Soil Conservation Service (USDA SCS). August 1972. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. In cooperation with the University of Hawaii Agricultural Experiment Station.*

Wentsel, R.S., et al. 1996. Tri-Service Procedural Guidelines for Ecological Risk Assessments, Volume I. U.S. Army; The Institute of Wildlife and Environmental Toxicology, Clemson University; Geo-Centers, Inc.; EA Engineering, Science

Wil Chee Planning. September 2009. *Site Investigation Report at the Pali Training Camp, Heeia Combat Training Area, and Waikane Training Area, Oahu, Hawaii.*

This space is intentionally left blank.

FIGURES



N

4 2 0 4

Miles

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 1-1
Site Location

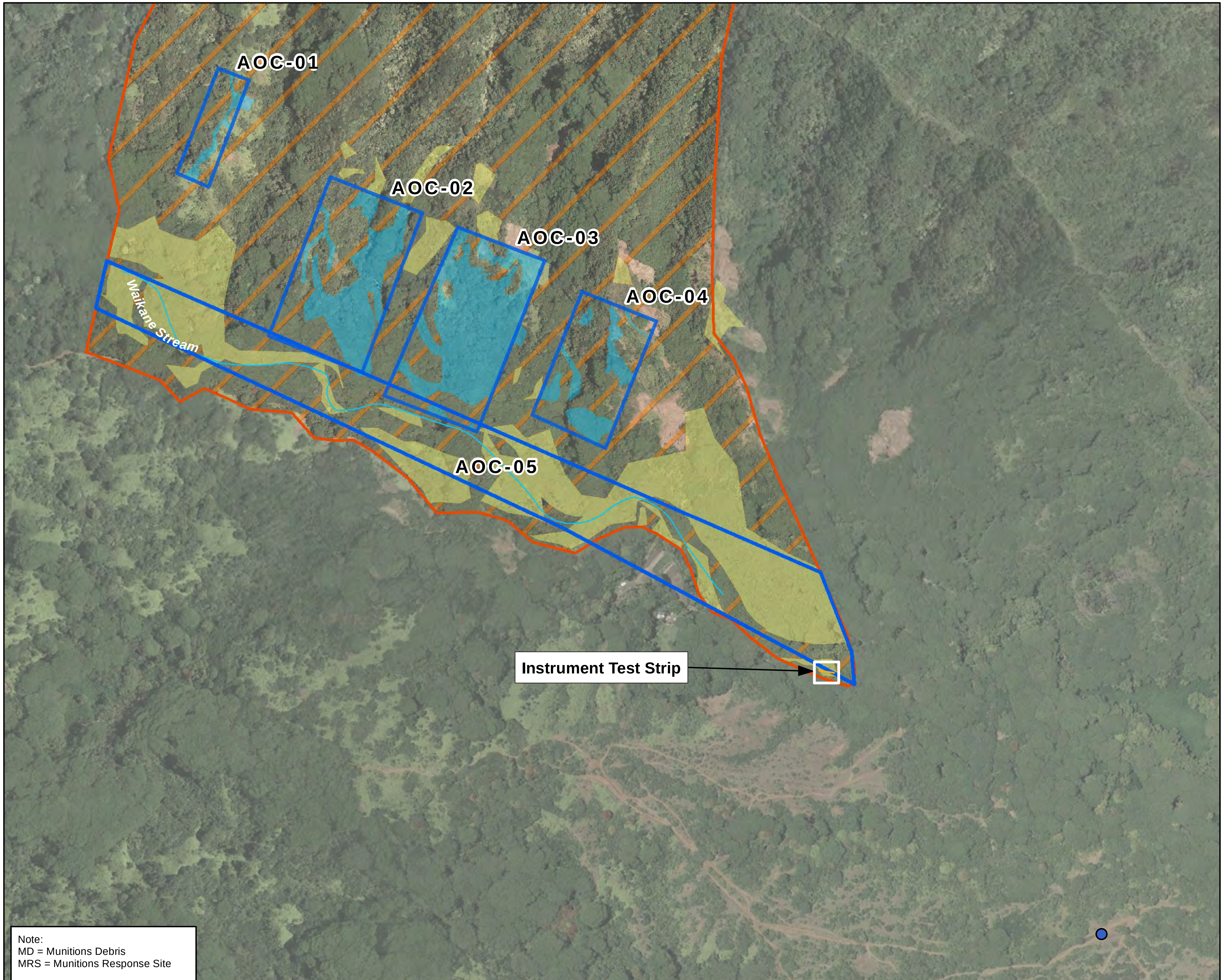
Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- City
- Major Road
- Area of Concern
- Waikane MRS Boundary
- Ocean

USA Environmental, Inc. | NAVFAC Naval Facilities Engineering Command

Drawn By: RM/JAL	Scale: 1 inch = 4 miles	Rev: 2	
Checked By: SC	Date Drawn: 07/19/10		
Submitted By: JC	Revision Date: 2-24-2011		
Path:			



N

440 220 0 440

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 1-2
Site Overview

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

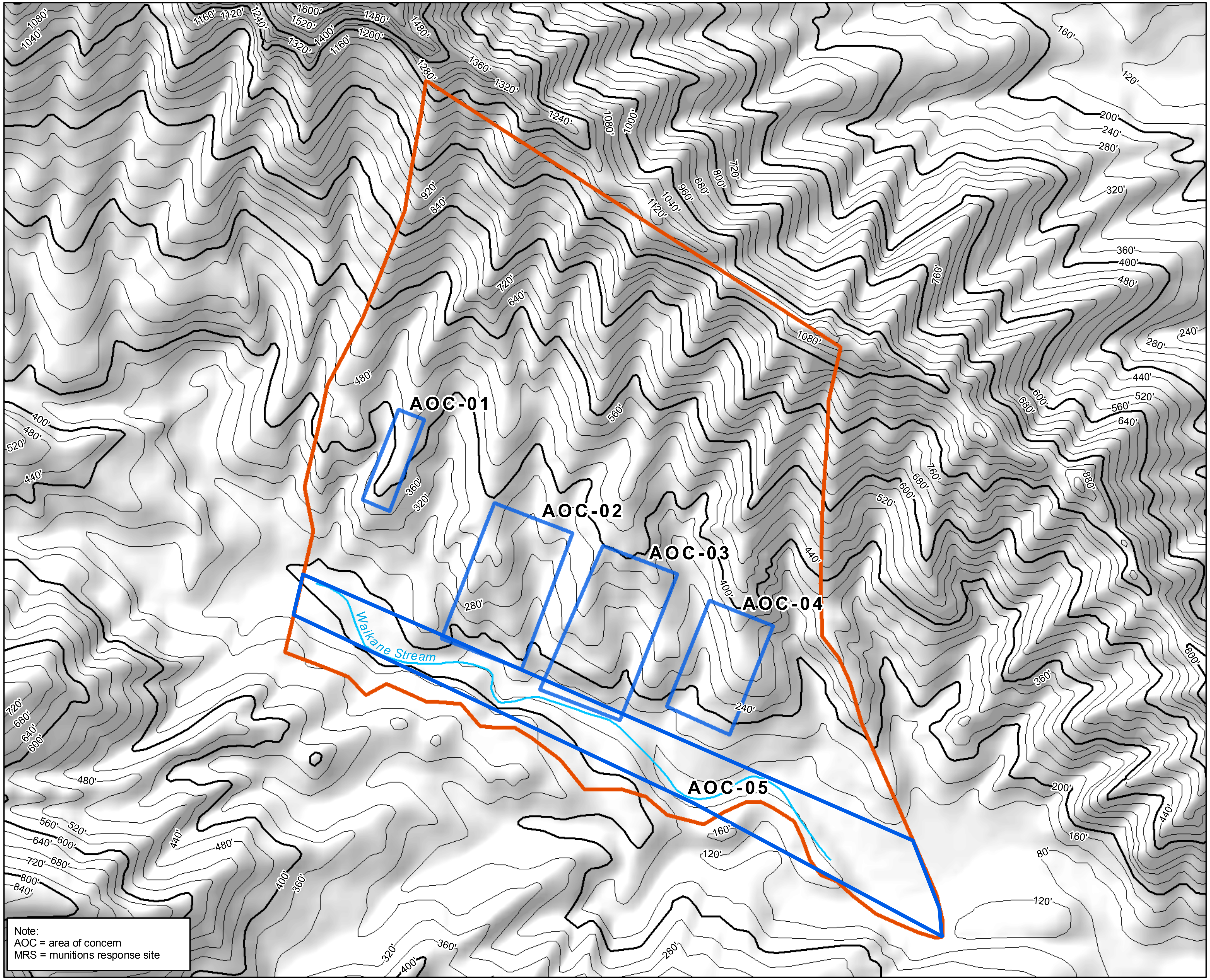
Legend

- MD Processing Area
- Instrument Test Strip
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (< 30 Degree Slope)
- Area of Concern
- Waikane Stream
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 433 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/01/10	
Path:		



N

500 250 0 500

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 2-1

Site Topography

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 500 feet	Rev: 1
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 10/01/10	
	Path:	

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG2-1_SITETOPOGRAPHY.MXD RMANGAN 7/28/2010 12:47:39

Figure 2-2

Reconnaissance Overview Map - 2008 SI

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

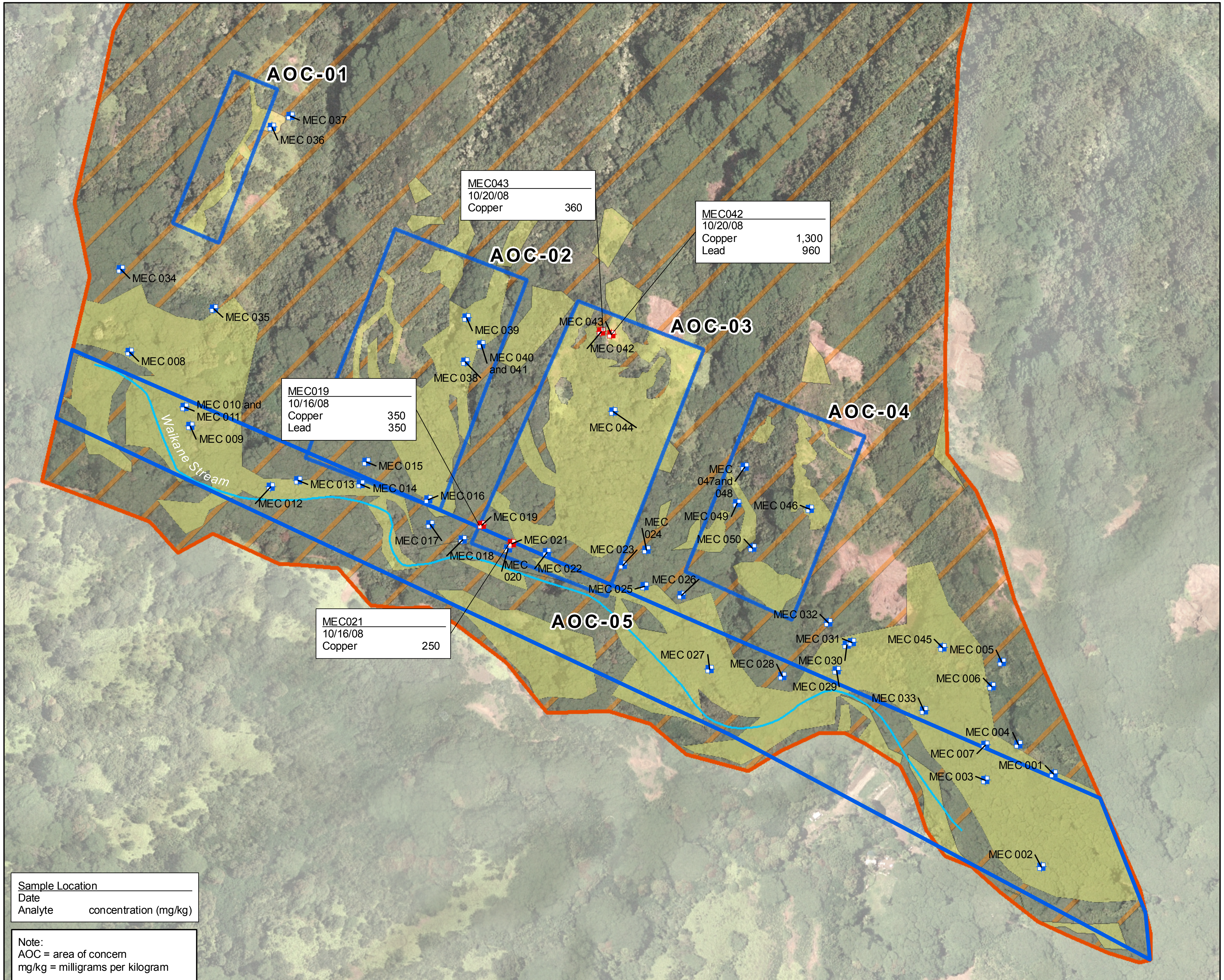
- 2008 SI Recon Data Points
- 2008 SI Traversed Track (9.5 ac.)
- 2008 SI Cell Locations (5.2 ac.)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 400 feet	Rev: 1	
Checked By: SC	Date Drawn: 07/16/10		
Submitted By: JC	Revision Date: 10/01/10		
	Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG2-2_RECONOVERVIEW.MXD RMANGAN 7/19/2010 16:25:09



N

300 150 0 300

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 2-3

2008 SI Soil Sampling Locations

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- >30 Degree Slope Area
- < 30 Degree Slope Area

2008 SI Soil Sampling Point

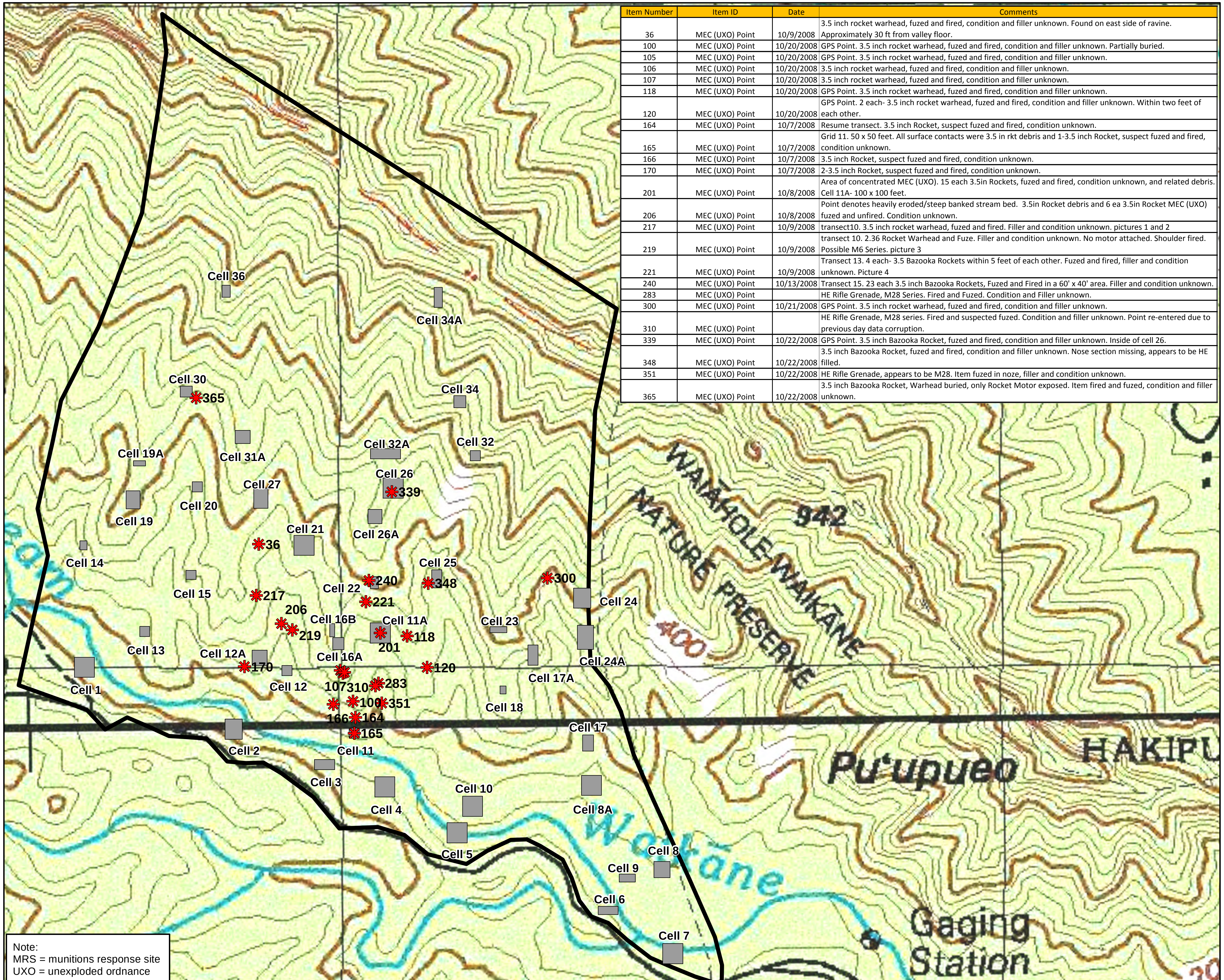
- No exceedance
- Exceedance detected
- Area of Concern
- Waikane Stream
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 300 feet	Rev: 1
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 10/01/10	
	Path:	

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG2-3_2008SI_MC_RESULTS.MXD RMANGAN 7/21/2010 12:50:28



Item Number	Item ID	Date	Comments
36	MEC (UXO) Point	10/9/2008	3.5 inch rocket warhead, fuzed and fired, condition and filler unknown. Found on east side of ravine. Approximately 30 ft from valley floor.
100	MEC (UXO) Point	10/20/2008	GPS Point. 3.5 inch rocket warhead, fuzed and fired, condition and filler unknown. Partially buried.
105	MEC (UXO) Point	10/20/2008	GPS Point. 3.5 inch rocket warhead, fuzed and fired, condition and filler unknown.
106	MEC (UXO) Point	10/20/2008	3.5 inch rocket warhead, fuzed and fired, condition and filler unknown.
107	MEC (UXO) Point	10/20/2008	3.5 inch rocket warhead, fuzed and fired, condition and filler unknown.
118	MEC (UXO) Point	10/20/2008	GPS Point. 3.5 inch rocket warhead, fuzed and fired, condition and filler unknown.
120	MEC (UXO) Point	10/20/2008	GPS Point. 2 each- 3.5 inch rocket warhead, fuzed and fired, condition and filler unknown. Within two feet of each other.
164	MEC (UXO) Point	10/7/2008	Resume transect. 3.5 inch Rocket, suspect fuzed and fired, condition unknown.
165	MEC (UXO) Point	10/7/2008	Grid 11. 50 x 50 feet. All surface contacts were 3.5 in rkt debris and 1-3.5 inch Rocket, suspect fuzed and fired, condition unknown.
166	MEC (UXO) Point	10/7/2008	3.5 inch Rocket, suspect fuzed and fired, condition unknown.
170	MEC (UXO) Point	10/7/2008	2-3.5 inch Rocket, suspect fuzed and fired, condition unknown.
201	MEC (UXO) Point	10/8/2008	Area of concentrated MEC (UXO). 15 each 3.5in Rockets, fuzed and fired, condition unknown, and related debris. Cell 11A- 100 x 100 feet.
206	MEC (UXO) Point	10/8/2008	Point denotes heavily eroded/steep banked stream bed. 3.5in Rocket debris and 6 ea 3.5in Rocket MEC (UXO) fuzed and unfired. Condition unknown.
217	MEC (UXO) Point	10/9/2008	transect10. 3.5 inch rocket warhead, fuzed and fired. Filler and condition unknown. pictures 1 and 2
219	MEC (UXO) Point	10/9/2008	transect 10. 2.36 Rocket Warhead and Fuze. Filler and condition unknown. No motor attached. Shoulder fired. Possible M6 Series. picture 3
221	MEC (UXO) Point	10/9/2008	Transect 13. 4 each- 3.5 Bazooka Rockets within 5 feet of each other. Fuzed and fired, filler and condition unknown. Picture 4
240	MEC (UXO) Point	10/13/2008	Transect 15. 23 each 3.5 inch Bazooka Rockets, Fuzed and Fired in a 60' x 40' area. Filler and condition unknown.
283	MEC (UXO) Point		HE Rifle Grenade, M28 Series. Fired and Fuzed. Condition and Filler unknown.
300	MEC (UXO) Point	10/21/2008	GPS Point. 3.5 inch rocket warhead, fuzed and fired, condition and filler unknown.
310	MEC (UXO) Point		HE Rifle Grenade, M28 series. Fired and suspected fuzed. Condition and filler unknown. Point re-entered due to previous day data corruption.
339	MEC (UXO) Point	10/22/2008	GPS Point. 3.5 inch Bazooka Rocket, fuzed and fired, condition and filler unknown. Inside of cell 26.
348	MEC (UXO) Point	10/22/2008	3.5 inch Bazooka Rocket, fuzed and fired, condition and filler unknown. Nose section missing, appears to be HE filled.
351	MEC (UXO) Point	10/22/2008	HE Rifle Grenade, appears to be M28. Item fuzed in noze, filler and condition unknown.
365	MEC (UXO) Point	10/22/2008	3.5 inch Bazooka Rocket, Warhead buried, only Rocket Motor exposed. Item fired and fuzed, condition and filler unknown.

N

475 237.5 0 475
Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

Figure 2-4

2008 SI MEC (UXO) Surface Findings Map

Waikane Valley Training Area
Koolaupoko District, O'ahu, Hawai'i

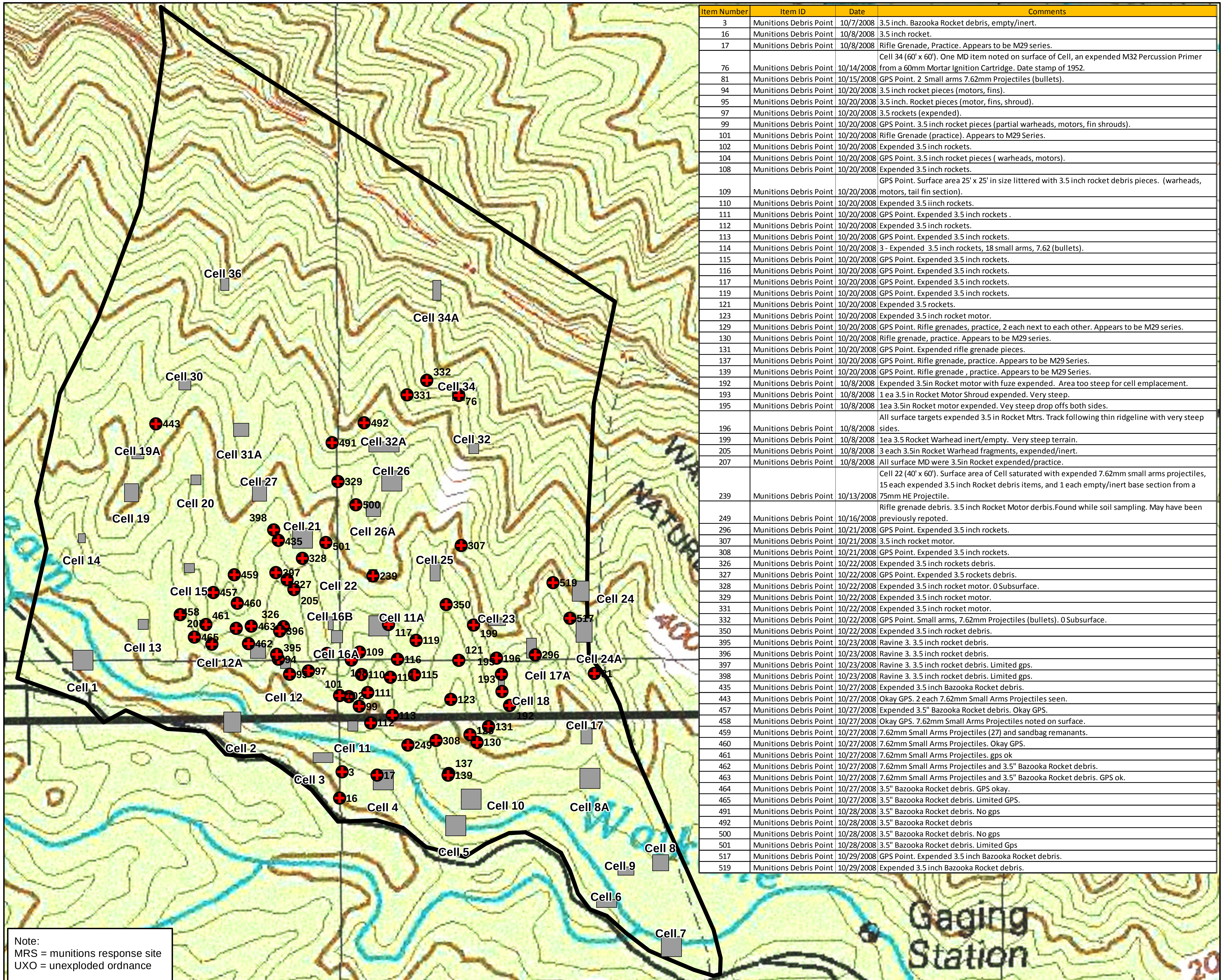
Legend

- MEC (UXO) Point
- Cell Locations (5.2 ac.)
- Waikane Boundary

USA Environmental, Inc.

Drawn By:	JAL	Scale:	1 inch = 475 feet	Rev:	
Checked By:	DM	Date Drawn:	12-16-2008		
Submitted By:	RN	Revision Date:			

Path:
S:\Waikane\report\
mec_uxo surface findings map.mxd



Note:
MRS = munitions response site
UXO = unexploded ordnance

Item Number	Item ID	Date	Comments
3	Munitions Debris Point	10/7/2008	3.5 inch. Bazooka Rocket debris, empty/inert.
16	Munitions Debris Point	10/8/2008	3.5 inch rocket.
17	Munitions Debris Point	10/8/2008	Rifle Grenade, Practice. Appears to be M29 series.
76	Munitions Debris Point	10/14/2008	Cell 34 (60' x 60'). One MD item noted on surface of Cell, an expended M32 Percussion Primer from a 60mm Mortar Ignition Cartridge. Date stamp of 1952.
81	Munitions Debris Point	10/15/2008	GPS Point. 2 Small arms 7.62mm Projectiles (bullets).
94	Munitions Debris Point	10/20/2008	3.5 inch rocket pieces (motors, fins).
95	Munitions Debris Point	10/20/2008	3.5 inch. Rocket pieces (motor, fins, shroud).
97	Munitions Debris Point	10/20/2008	3.5 rockets (expended).
99	Munitions Debris Point	10/20/2008	GPS Point. 3.5 inch rocket pieces (partial warheads, motors, fin shrouds).
101	Munitions Debris Point	10/20/2008	Rifle Grenade (practice). Appears to M29 Series.
102	Munitions Debris Point	10/20/2008	Expended 3.5 inch rockets.
104	Munitions Debris Point	10/20/2008	GPS Point. 3.5 inch rocket pieces (warheads, motors).
108	Munitions Debris Point	10/20/2008	Expended 3.5 inch rockets.
109	Munitions Debris Point	10/20/2008	GPS Point. Surface area 25' x 25' in size littered with 3.5 inch rocket debris pieces. (warheads, motors, tail fin section).
110	Munitions Debris Point	10/20/2008	Expended 3.5 iinch rockets.
111	Munitions Debris Point	10/20/2008	GPS Point. Expended 3.5 inch rockets .
112	Munitions Debris Point	10/20/2008	Expended 3.5 inch rockets.
113	Munitions Debris Point	10/20/2008	GPS Point. Expended 3.5 inch rockets.
114	Munitions Debris Point	10/20/2008	3 - Expended 3.5 inch rockets, 18 small arms, 7.62 (bullets).
115	Munitions Debris Point	10/20/2008	GPS Point. Expended 3.5 inch rockets.
116	Munitions Debris Point	10/20/2008	GPS Point. Expended 3.5 inch rockets.
117	Munitions Debris Point	10/20/2008	GPS Point. Expended 3.5 inch rockets.
119	Munitions Debris Point	10/20/2008	GPS Point. Expended 3.5 inch rockets.
121	Munitions Debris Point	10/20/2008	Expended 3.5 rockets.
123	Munitions Debris Point	10/20/2008	Expended 3.5 inch rocket motor.
129	Munitions Debris Point	10/20/2008	GPS Point. Rifle grenades, practice, 2 each next to each other. Appears to be M29 series.
130	Munitions Debris Point	10/20/2008	Rifle grenade, practice. Appears to be M29 series.
131	Munitions Debris Point	10/20/2008	GPS Point. Expended rifle grenade pieces.
137	Munitions Debris Point	10/20/2008	GPS Point. Rifle grenade, practice. Appears to be M29 Series.
139	Munitions Debris Point	10/20/2008	GPS Point. Rifle grenade , practice. Appears to be M29 Series.
192	Munitions Debris Point	10/8/2008	Expended 3.5in Rocket motor with fuze expended. Area too steep for cell emplacement.
193	Munitions Debris Point	10/8/2008	1 ea 3.5 in Rocket Motor Shroud expended. Very steep.
195	Munitions Debris Point	10/8/2008	1ea 3.5in Rocket motor expended. Vey steep drop offs both sides.
196	Munitions Debris Point	10/8/2008	All surface targets expended 3.5 in Rocket Mtrs. Track following thin ridgeline with very steep sides.
199	Munitions Debris Point	10/8/2008	1ea 3.5 Rocket Warhead inert/empty. Very steep terrain.
205	Munitions Debris Point	10/8/2008	3 each 3.5in Rocket Warhead fragments, expended/inert.
207	Munitions Debris Point	10/8/2008	All surface MD were 3.5in Rocket expended/practice.
239	Munitions Debris Point	10/13/2008	Cell 22 (40' x 60'). Surface area of Cell saturated with expended 7.62mm small arms projectiles, 15 each expended 3.5 inch Rocket debris items, and 1 each empty/inert base section from a 75mm HE Projectile.
249	Munitions Debris Point	10/16/2008	Rifle grenade debris. 3.5 inch Rocket Motor derbis.Found while soil sampling. May have been previously repoted.
296	Munitions Debris Point	10/21/2008	GPS Point. Expended 3.5 inch rockets.
307	Munitions Debris Point	10/21/2008	3.5 inch rocket motor.
308	Munitions Debris Point	10/21/2008	GPS Point. Expended 3.5 inch rockets.
326	Munitions Debris Point	10/22/2008	Expended 3.5 inch rockets debris.
327	Munitions Debris Point	10/22/2008	GPS Point. Expended 3.5 rockets debris.
328	Munitions Debris Point	10/22/2008	Expended 3.5 inch rocket motor. 0 Subsurface.
329	Munitions Debris Point	10/22/2008	Expended 3.5 inch rocket motor.
331	Munitions Debris Point	10/22/2008	Expended 3.5 inch rocket motor.
332	Munitions Debris Point	10/22/2008	GPS Point. Small arms, 7.62mm Projectiles (bullets). 0 Subsurface.
350	Munitions Debris Point	10/22/2008	Expended 3.5 inch rocket debris.
395	Munitions Debris Point	10/23/2008	Ravine 3. 3.5 inch rocket debris.
396	Munitions Debris Point	10/23/2008	Ravine 3. 3.5 inch rocket debris.
397	Munitions Debris Point	10/23/2008	Ravine 3. 3.5 inch rocket debris. Limited gps.
398	Munitions Debris Point	10/23/2008	Ravine 3. 3.5 inch rocket debris. Limited gps.
435	Munitions Debris Point	10/27/2008	Expended 3.5 inch Bazooka Rocket debris.
443	Munitions Debris Point	10/27/2008	Okay GPS. 2 each 7.62mm Small Arms Projectiles seen.
457	Munitions Debris Point	10/27/2008	Expended 3.5" Bazooka Rocket debris. Okay GPS.
458	Munitions Debris Point	10/27/2008	Okay GPS. 7.62mm Small Arms Projectiles noted on surface.
459	Munitions Debris Point	10/27/2008	7.62mm Small Arms Projectiles (27) and sandbag remanants.
460	Munitions Debris Point	10/27/2008	7.62mm Small Arms Projectiles. Okay GPS.
461	Munitions Debris Point	10/27/2008	7.62mm Small Arms Projectiles. gps ok
462	Munitions Debris Point	10/27/2008	7.62mm Small Arms Projectiles and 3.5" Bazooka Rocket debris.
463	Munitions Debris Point	10/27/2008	7.62mm Small Arms Projectiles and 3.5" Bazooka Rocket debris. GPS ok.
464	Munitions Debris Point	10/27/2008	3.5" Bazooka Rocket debris. GPS okay.
465	Munitions Debris Point	10/27/2008	3.5" Bazooka Rocket debris. Limited GPS.
491	Munitions Debris Point	10/28/2008	3.5" Bazooka Rocket debris. No gps
492	Munitions Debris Point	10/28/2008	3.5" Bazooka Rocket debris
500	Munitions Debris Point	10/28/2008	3.5" Bazooka Rocket debris. No gps
501	Munitions Debris Point	10/28/2008	3.5" Bazooka Rocket debris. Limited Gps
517	Munitions Debris Point	10/29/2008	GPS Point. Expended 3.5 inch Bazooka Rocket debris.
519	Munitions Debris Point	10/29/2008	Expended 3.5 inch Bazooka Rocket debris.

N

475 237.5 0 475

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

Figure 2-5

2008 SI Munitions Debris Surface Findings Map

Waikane Valley Training Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Waikane SI Data
- Cell Locations (5.2 ac.)
- Waikane Boundary

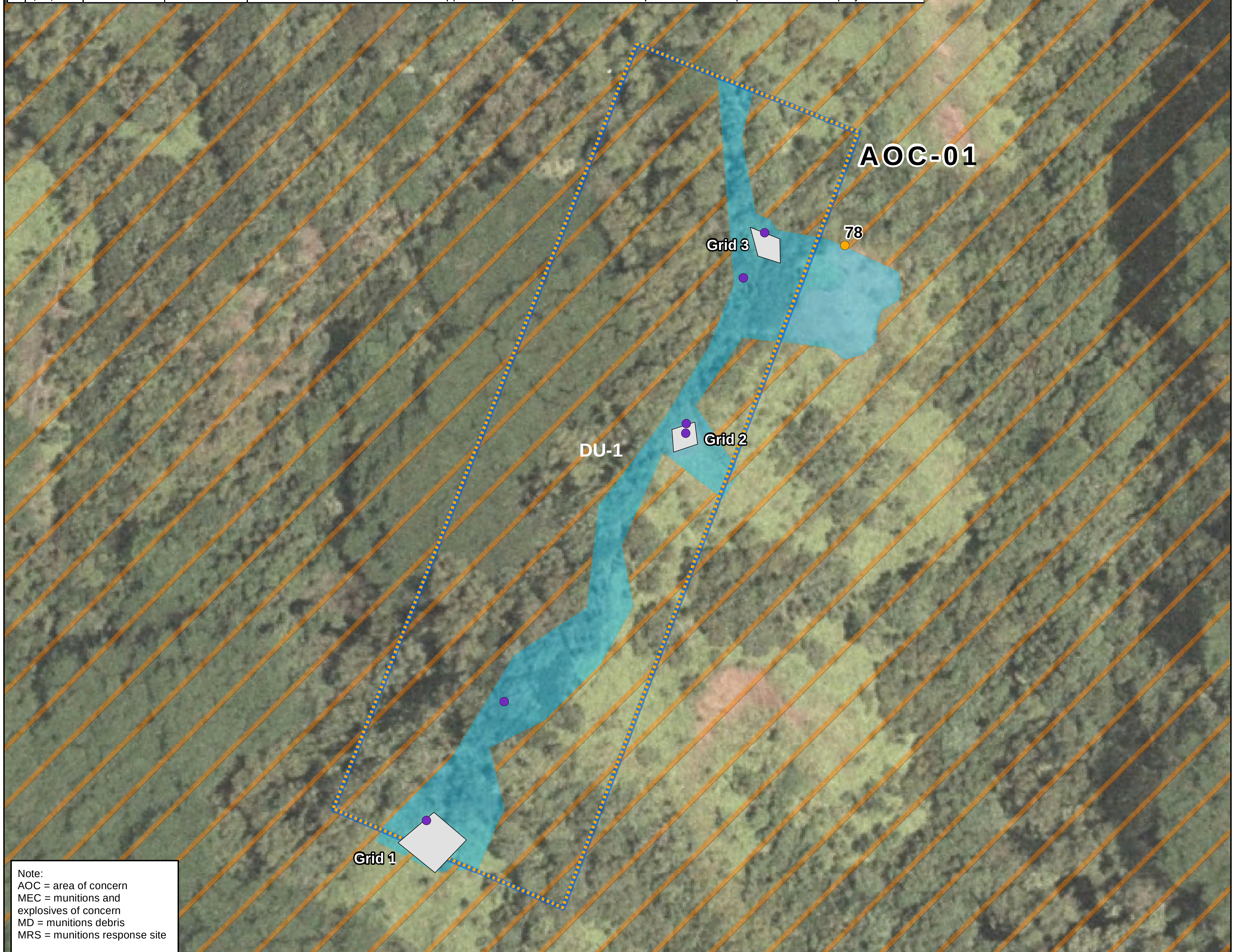
USA Environmental, Inc.

NAVFAC
Naval Facilities Engineering Command

Drawn By:	JAL	Scale:	1 inch = 475 feet	Rev:
Checked By:	DM	Date Drawn:	12-16-2008	
Submitted By:	RN	Revision Date:		

Path:
S:\Waikane\report\
MD surface findings map.mxd

ID	Date	Anomaly Type	Anomaly Class	Comments
78	4/14/2010	Small Arms	MD	Point taken identifies a surface area approximately 30 ft in diameter densely covered with expended small arms projectiles.



N
60 30 0 60
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-1

AOC-01 Layout & MEC Findings

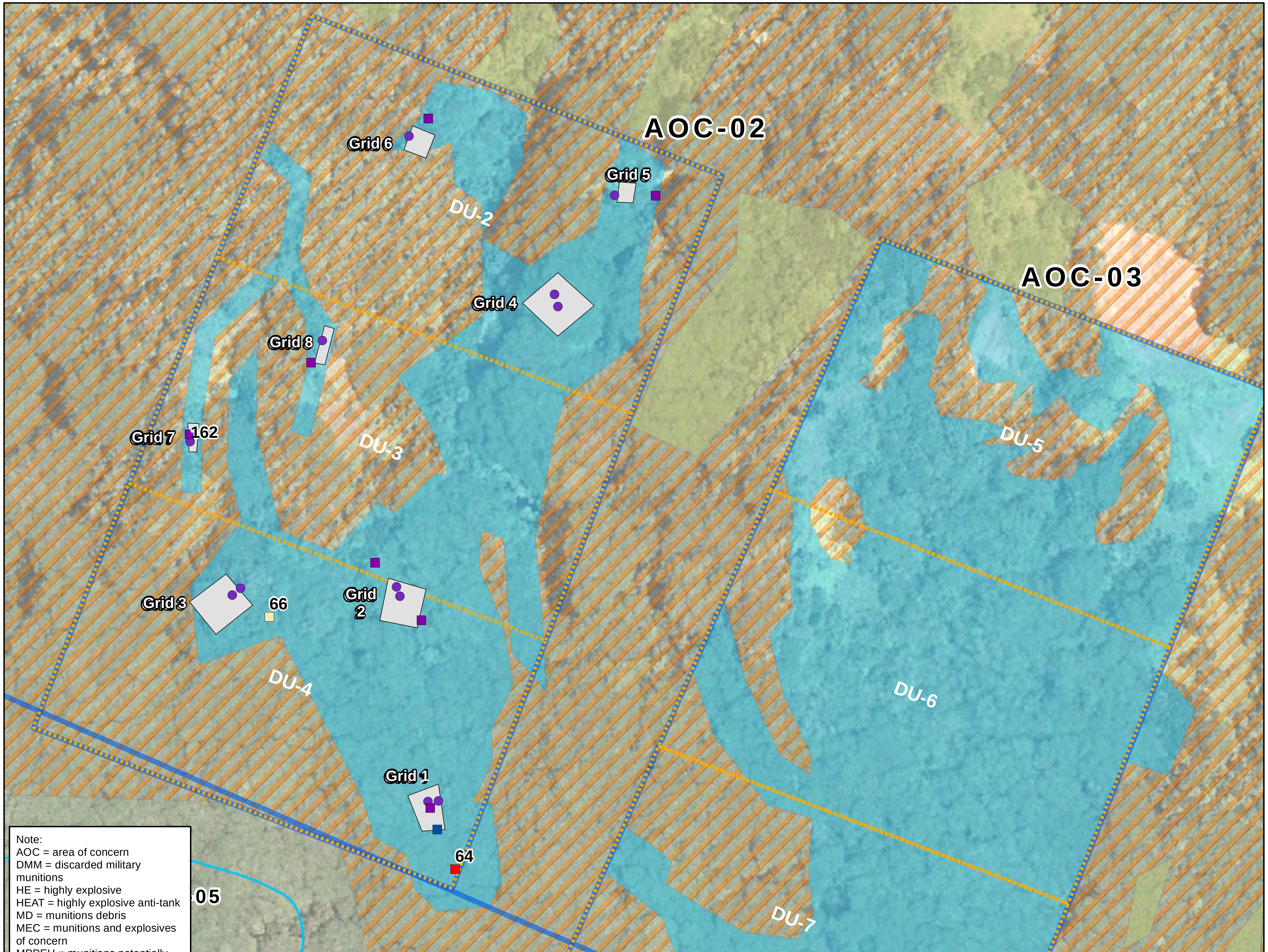
Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Munitions Debris
- Seed Item
- Area of Concern
- Cleared Area (<30 Degree Slope Area)
- >30 Degree Slope Area
- Decision Unit
- Intrusive Test Grid
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

Drawn By: RM/JAL	Scale:	Rev: 2
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 2/28/2011	
Path:		



Note:
AOC = area of concern
DMM = discarded military munitions
HE = highly explosive
HEAT = highly explosive anti-tank
MD = munitions debris
MEC = munitions and explosives of concern
MPPEH = munitions potentially presenting an explosive hazard
MRS = munitions response site
UXO = unexploded ordnance

ID	Date	Anomaly Type	Anomaly Class	Comments
64	4/12/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, Point Initiating Device broken off, Base Detonating Fuze intact. Item left in place for BIP disposal.
66	4/12/2010	Explosive Demolition Charge (Military)	DMM	Demolition Block, TNT, 1/4 lb. Lot Number not legible. Item moved and consolidated with M28 HEAT Rifle Grenade (UXO Item ID #11) located in southwestern area of AOC3.

Figure 3-2

AOC-02 Layout & MEC Findings

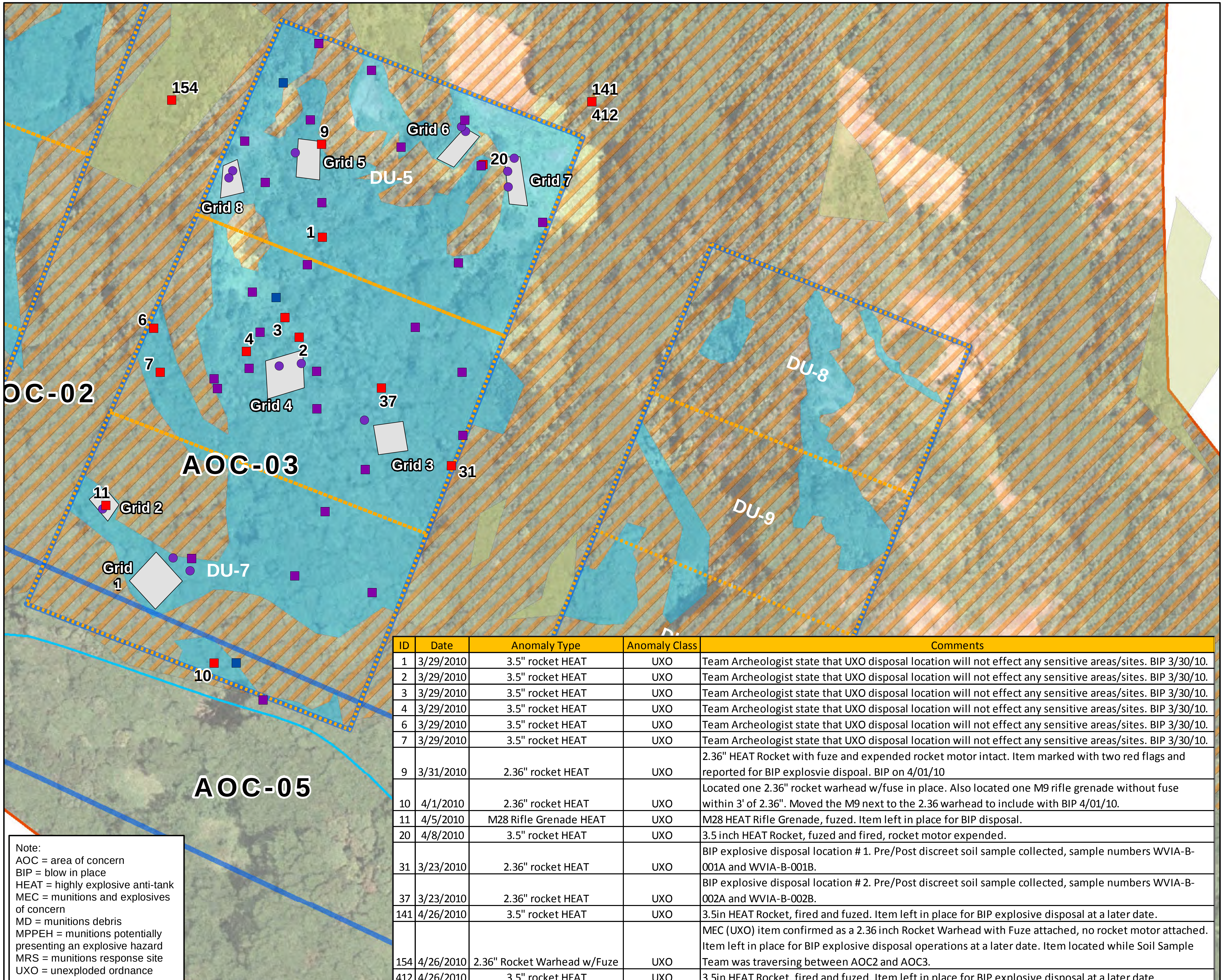
Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM/JAL	Scale: 1 inch = 100 feet	Rev: 2		
Checked By: SC	Date Drawn: 07/16/10			
Submitted By: JC	Revision Date: 2-24-2011			
Path:				

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-2_AOC-2.MXD RMANGAN 10/4/2010 09:14:08



Note:
AOC = area of concern
BIP = blow in place
HEAT = highly explosive anti-tank
MEC = munitions and explosives of concern
MD = munitions debris
MPPEH = munitions potentially presenting an explosive hazard
MRS = munitions response site
UXO = unexploded ordnance

ID	Date	Anomaly Type	Anomaly Class	Comments
1	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
2	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
3	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
4	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
6	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
7	3/29/2010	3.5" rocket HEAT	UXO	Team Archeologist state that UXO disposal location will not effect any sensitive areas/sites. BIP 3/30/10.
9	3/31/2010	2.36" rocket HEAT	UXO	2.36" HEAT Rocket with fuze and expended rocket motor intact. Item marked with two red flags and reported for BIP explosvie dispoal. BIP on 4/01/10
10	4/1/2010	2.36" rocket HEAT	UXO	Located one 2.36" rocket warhead w/fuse in place. Also located one M9 rifle grenade without fuse within 3' of 2.36". Moved the M9 next to the 2.36 warhead to include with BIP 4/01/10.
11	4/5/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
20	4/8/2010	3.5" rocket HEAT	UXO	3.5 inch HEAT Rocket, fuzed and fired, rocket motor expended.
31	3/23/2010	2.36" rocket HEAT	UXO	BIP explosive disposal location # 1. Pre/Post discreet soil sample collected, sample numbers WVIA-B-001A and WVIA-B-001B.
37	3/23/2010	2.36" rocket HEAT	UXO	BIP explosive disposal location # 2. Pre/Post discreet soil sample collected, sample numbers WVIA-B-002A and WVIA-B-002B.
141	4/26/2010	3.5" rocket HEAT	UXO	3.5in HEAT Rocket, fired and fuzed. Item left in place for BIP explosive disposal at a later date.
154	4/26/2010	2.36" Rocket Warhead w/Fuze	UXO	MEC (UXO) item confirmed as a 2.36 inch Rocket Warhead with Fuze attached, no rocket motor attached. Item left in place for BIP explosive disposal operations at a later date. Item located while Soil Sample Team was traversing between AOC2 and AOC3.
412	4/26/2010	3.5" rocket HEAT	UXO	3.5in HEAT Rocket, fired and fuzed. Item left in place for BIP explosive disposal at a later date.

N

125 62.5 0 125

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-3

AOC-03 Layout & MEC Findings

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

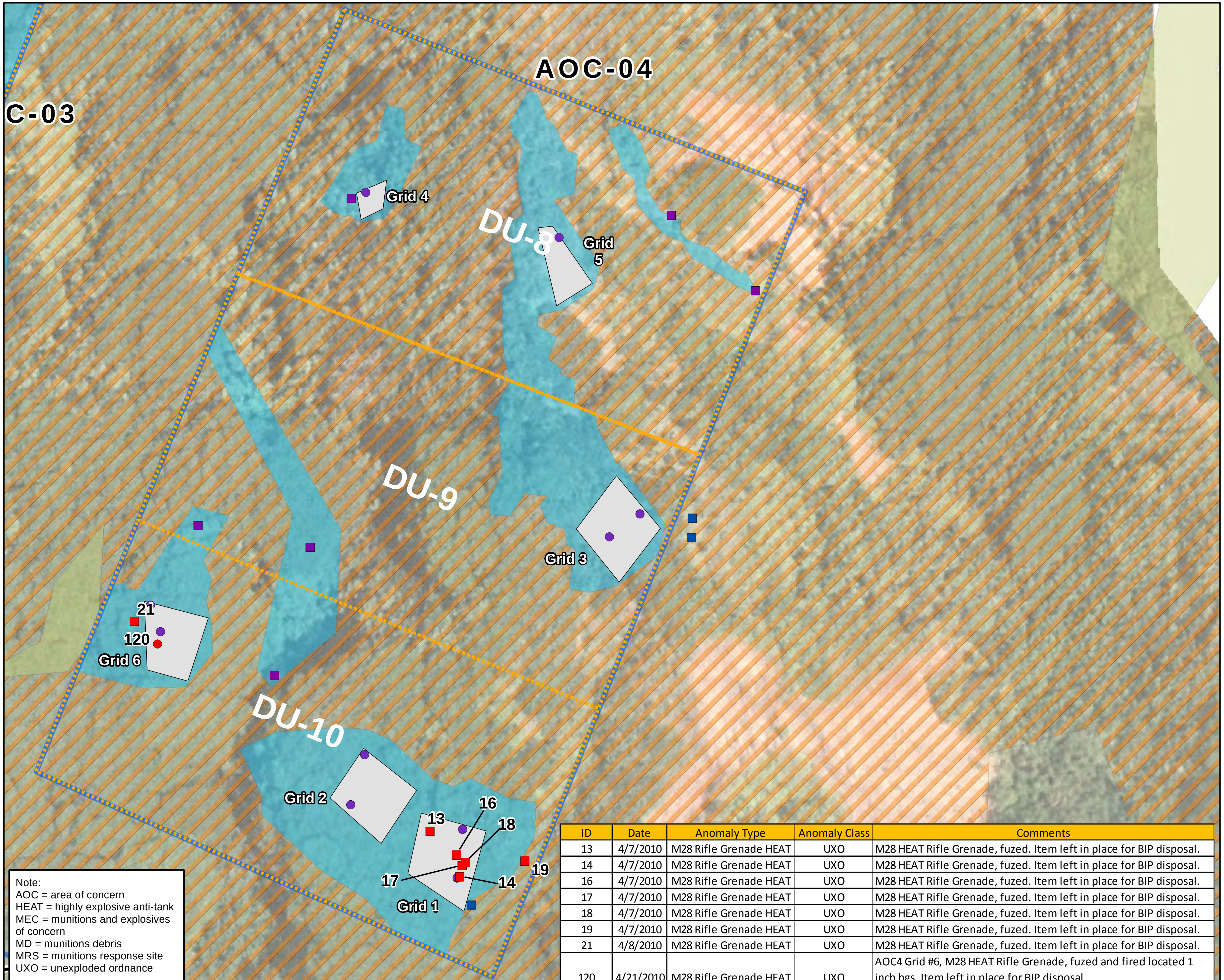
Legend

Surface Clearance
- MD Consoliidation
- UXO
- Seed Item
- Seed Item
- Intrusive Test Grid
- Decision Unit
- Area of Concern
- Cleared Area (<30 Degree Slope Area)
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Waikane Stream

USA Environmental, Inc.

Drawn By:	RM/JAL	Scale:	1 inch = 125 feet	Rev:	2
Checked By:	SC	Date Drawn:	07/16/10		
Submitted By:	JC	Revision Date:	2-24-2011		

Path:



ID	Date	Anomaly Type	Anomaly Class	Comments
13	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
14	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
16	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
17	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
18	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
19	4/7/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
21	4/8/2010	M28 Rifle Grenade HEAT	UXO	M28 HEAT Rifle Grenade, fuzed. Item left in place for BIP disposal.
120	4/21/2010	M28 Rifle Grenade HEAT	UXO	AOC4 Grid #6, M28 HEAT Rifle Grenade, fuzed and fired located 1 inch bgs. Item left in place for BIP disposal.

Note:
AOC = area of concern
HEAT = highly explosive anti-tank
MEC = munitions and explosives of concern
MD = munitions debris
MRS = munitions response site
UXO = unexploded ordnance

N

70 35 0 70
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-4

AOC-04 Layout & MEC Findings

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

Surface Clearance
- MD Consoliidation
- UXO
- Seed Item

Subsurface Clearance
- UXO
- Seed Item

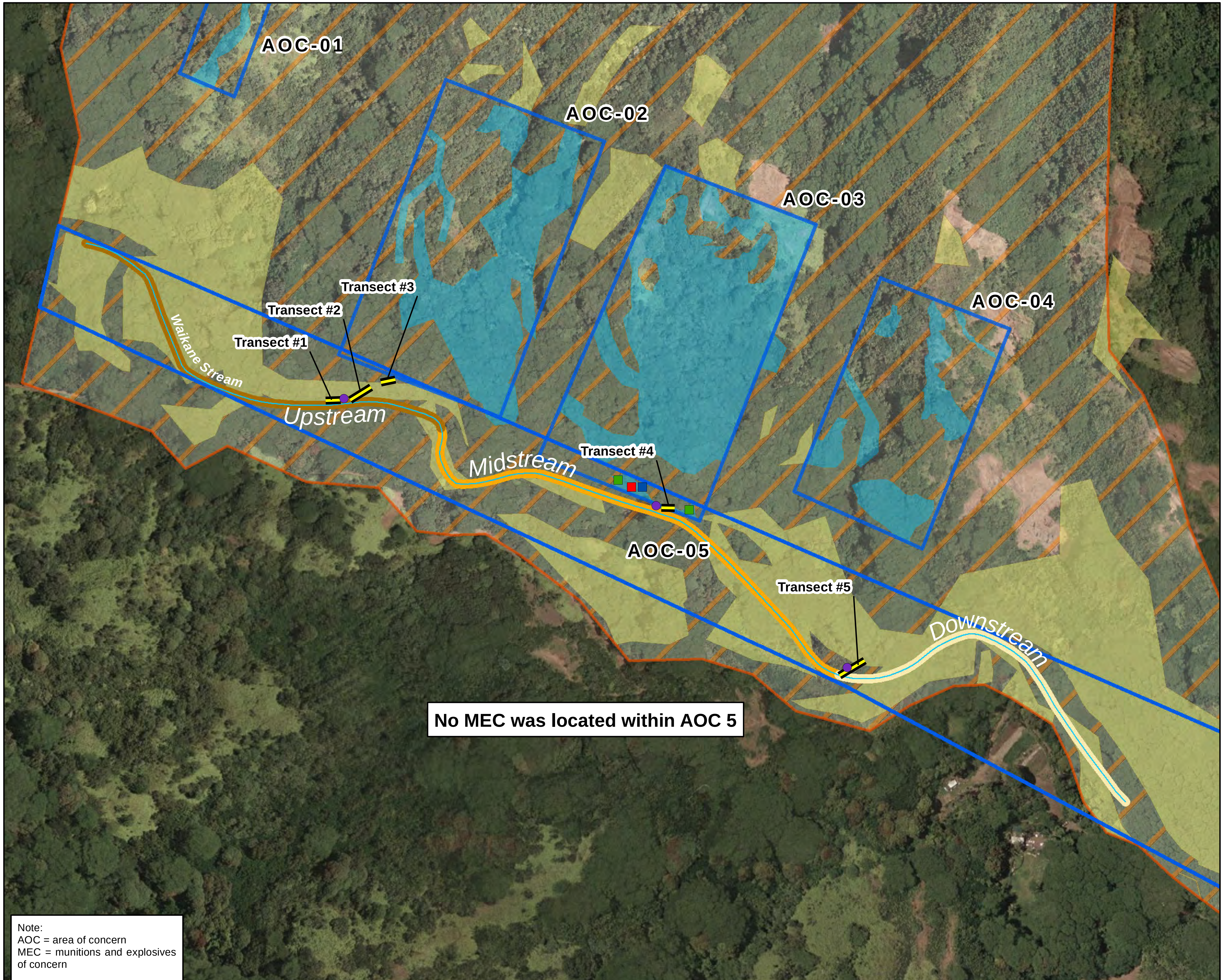
- Intrusive Test Grid
- Decision Unit
- Area of Concern
- Cleared Area (<30 Degree Slope Area)
- >30 Degree Slope Area
- < 30 Degree Slope Area

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM/JAL	Scale: 1 inch = 70 feet	Rev: 2	
Checked By: SC	Date Drawn: 07/16/10		
Submitted By: JC	Revision Date: 2-24-2011		
Path:			

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-4_AOC-4.MXD RMANGAN 10/4/2010 09:14:08



N

250 125 0 250
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-5

AOC-05 Layout & MEC Findings

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

AOC 3 Surface Items
- MD
- MD Consoliidation
- MPPEH
- UXO
- Seed Item

AOC 5 Subsurface Items
- Seed Item

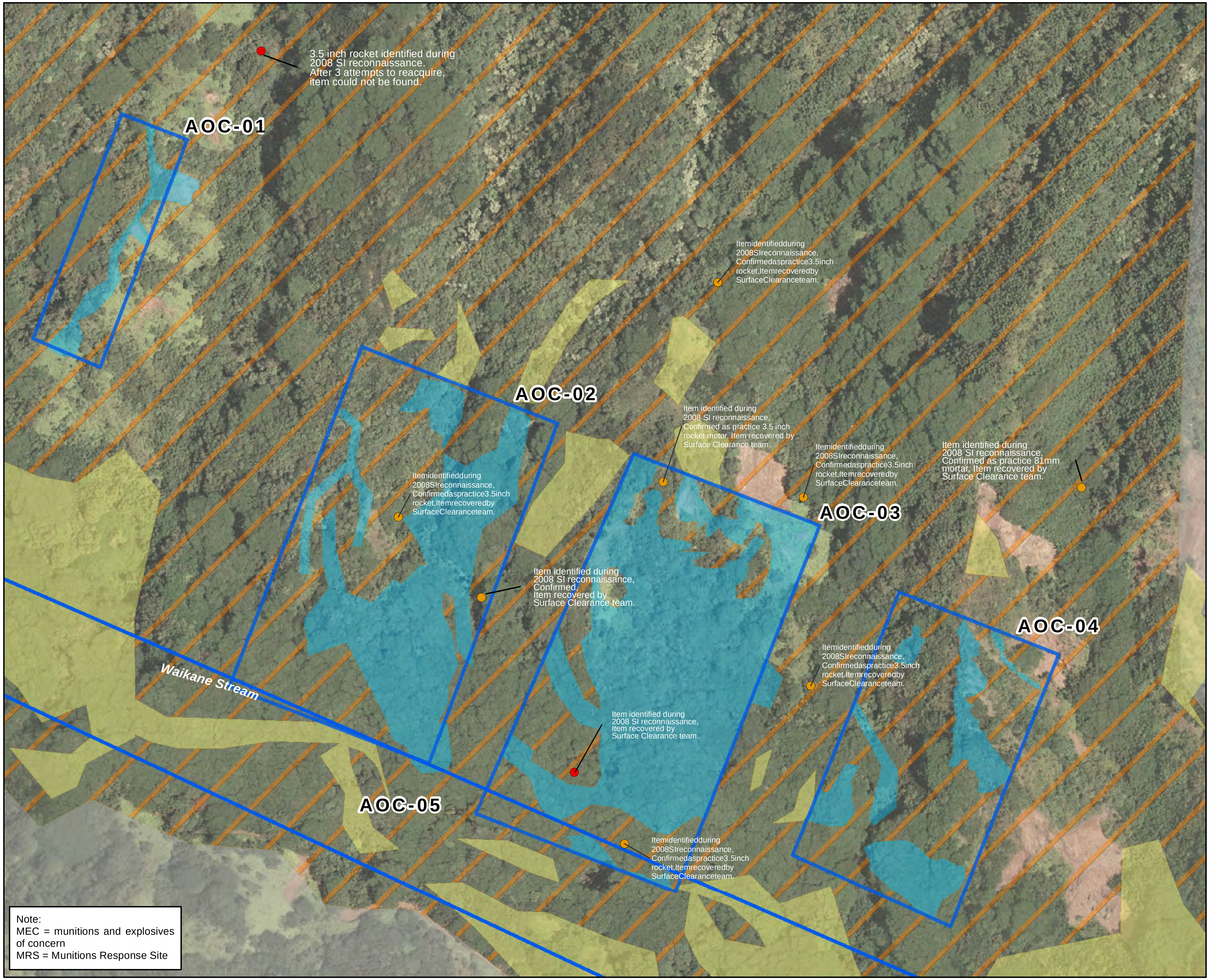
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (<30 degree slope)
- Intrusive Transect
- Area of Concern
- Waikane Stream
- Upstream
- Midstream
- Downstream
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 250 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/01/10	
	Path:	

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-5_AOC-5.MXD RMANGAN 7/28/2010 14:22:34



N

200 100 0 200

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-6

Reacquisition Locations of 2008 MEC Items

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

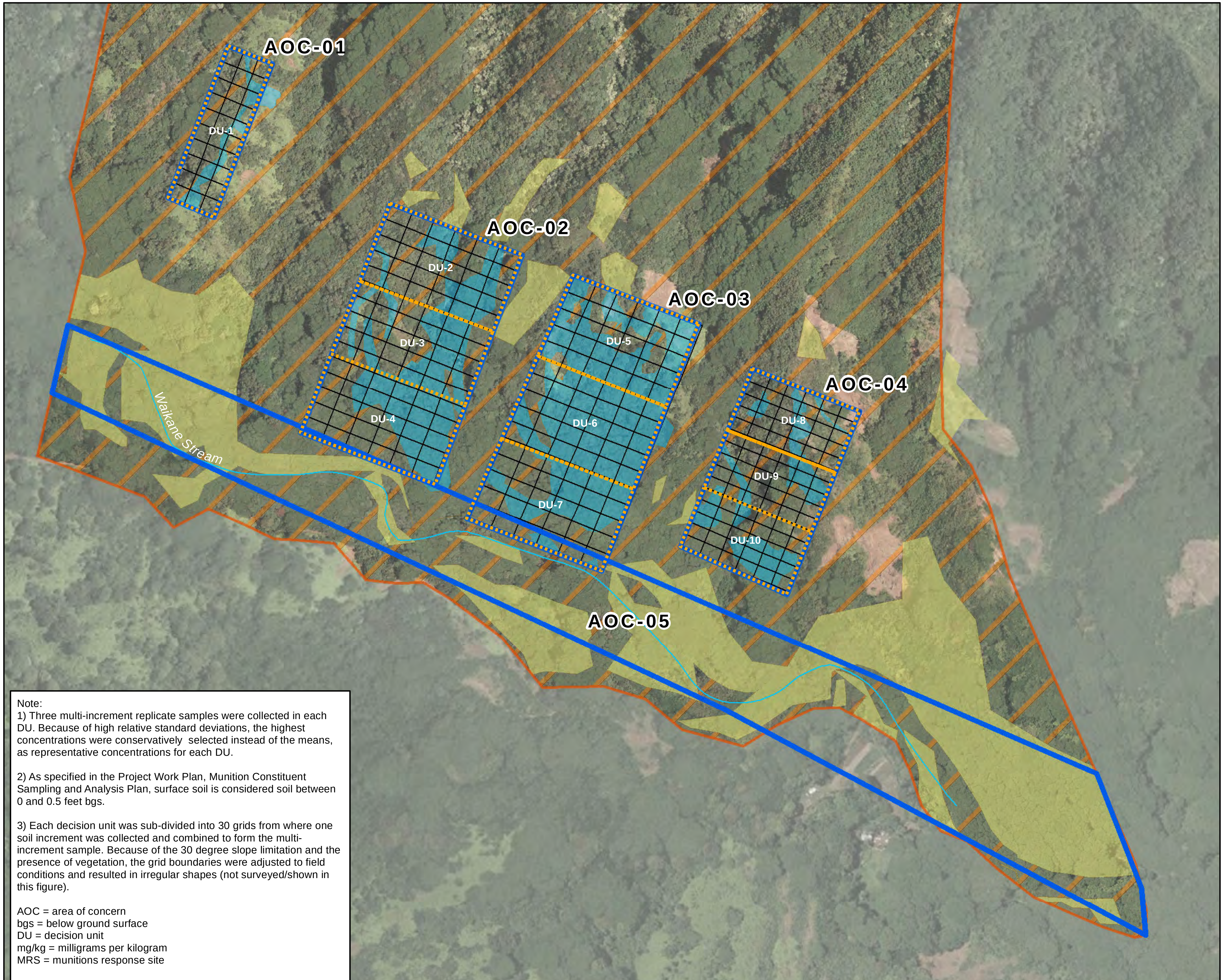
Legend

- Other
- Munitions Debris
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (<30 degree slope)
- Area of Concern
- Waikane Stream
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 200 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/01/10	
Path:		



Note:
1) Three multi-increment replicate samples were collected in each DU. Because of high relative standard deviations, the highest concentrations were conservatively selected instead of the means, as representative concentrations for each DU.

2) As specified in the Project Work Plan, Munition Constituent Sampling and Analysis Plan, surface soil is considered soil between 0 and 0.5 feet bgs.

3) Each decision unit was sub-divided into 30 grids from where one soil increment was collected and combined to form the multi-increment sample. Because of the 30 degree slope limitation and the presence of vegetation, the grid boundaries were adjusted to field conditions and resulted in irregular shapes (not surveyed/shown in this figure).

AOC = area of concern
bgs = below ground surface
DU = decision unit
mg/kg = milligrams per kilogram
MRS = munitions response site

N

300 150 0 300

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-7

Surface/Multi-Increment Soil Sample Locations

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

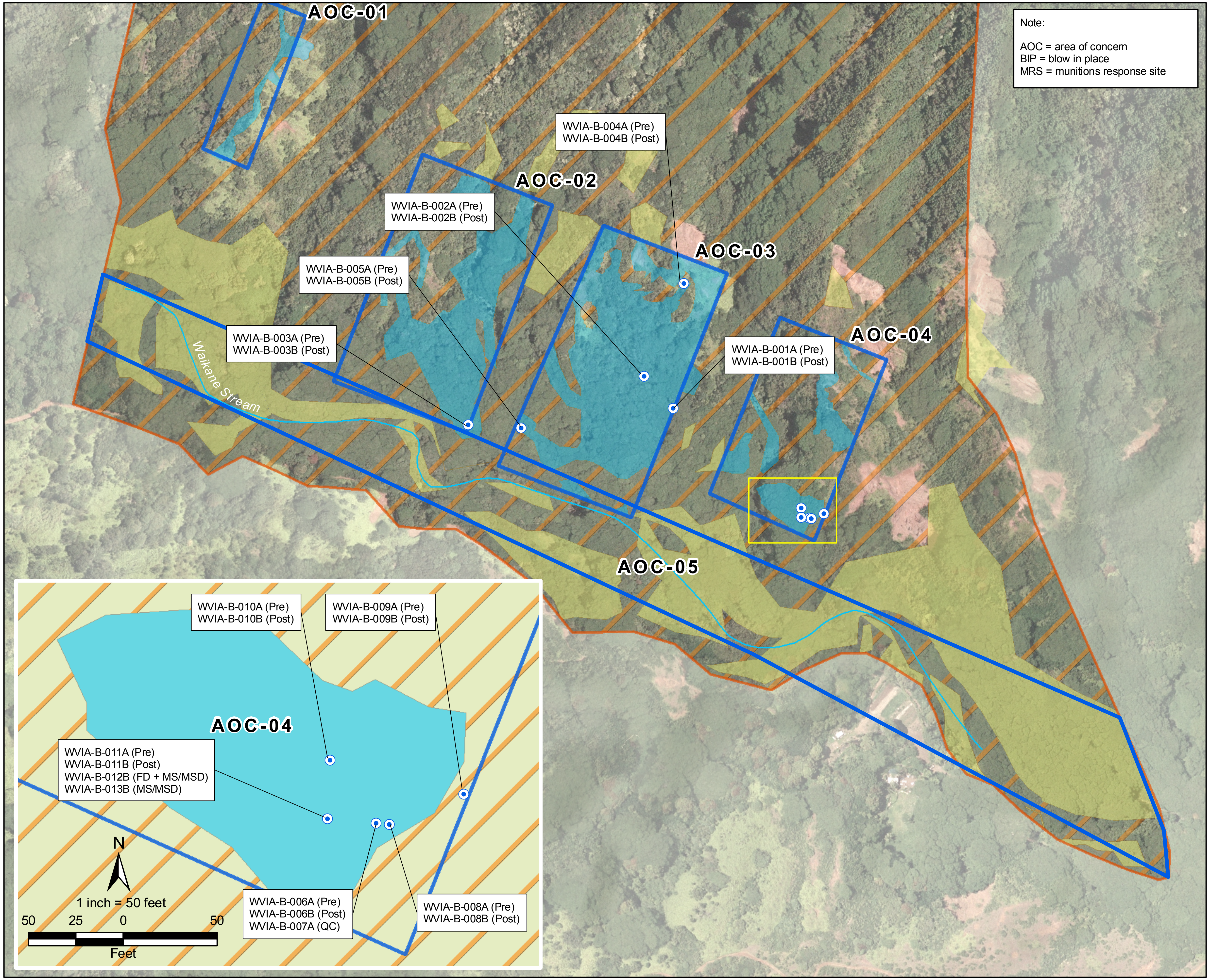
- Soil Sample Strata
- Decision Units
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (<30 Degree Slope)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 300 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/01/10	
	Path:	

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-7_SURFACE_MULTI_INCREMENT.MXD RMANGAN 7/9/2010 14:27:41



N

300 150 0 300

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-8

Blow In Place (BIP) Soil Sample Locations

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

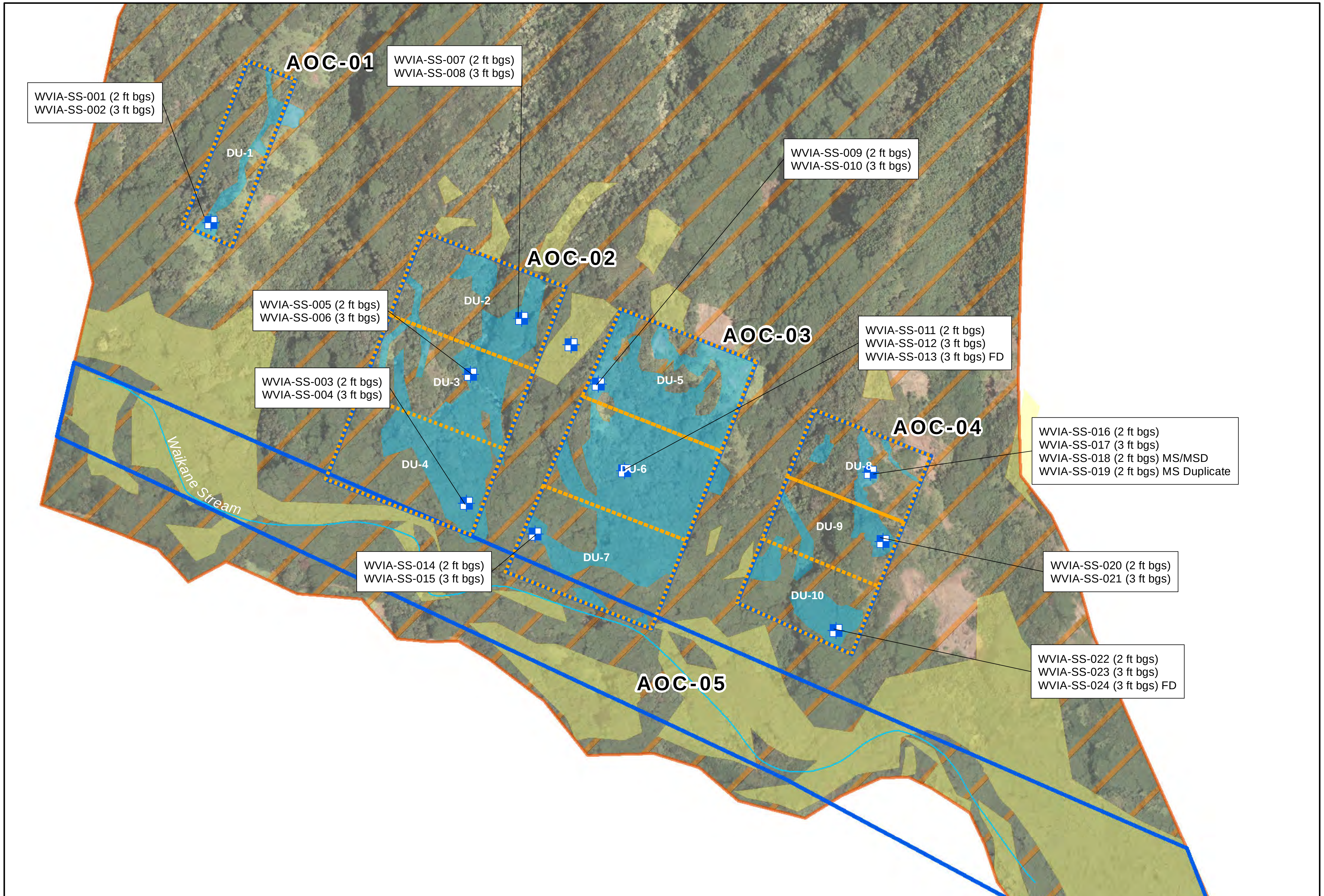
- BIP Soil Sample Locations
- Area of Concern
- Waikane MRS Boundary
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (< 30 Degree Slope)
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 300 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/01/10	
Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-8_BIP.MXD RMANGAN 7/22/2010 14:54:28



Note:
1) As specified in the Project Work Plan, Munition Constituent Sampling and Analysis Plan, subsurface soil is considered soil between 0.5 and 3.0 feet bgs.

AOC = area of concern
bgs = below ground surface
FD = field duplicate
MRS = munitions response site
MS/MSD = matrix spike/ matrix spike duplicate

N

300 150 0 300

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-9

Subsurface Soil Sample Locations

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

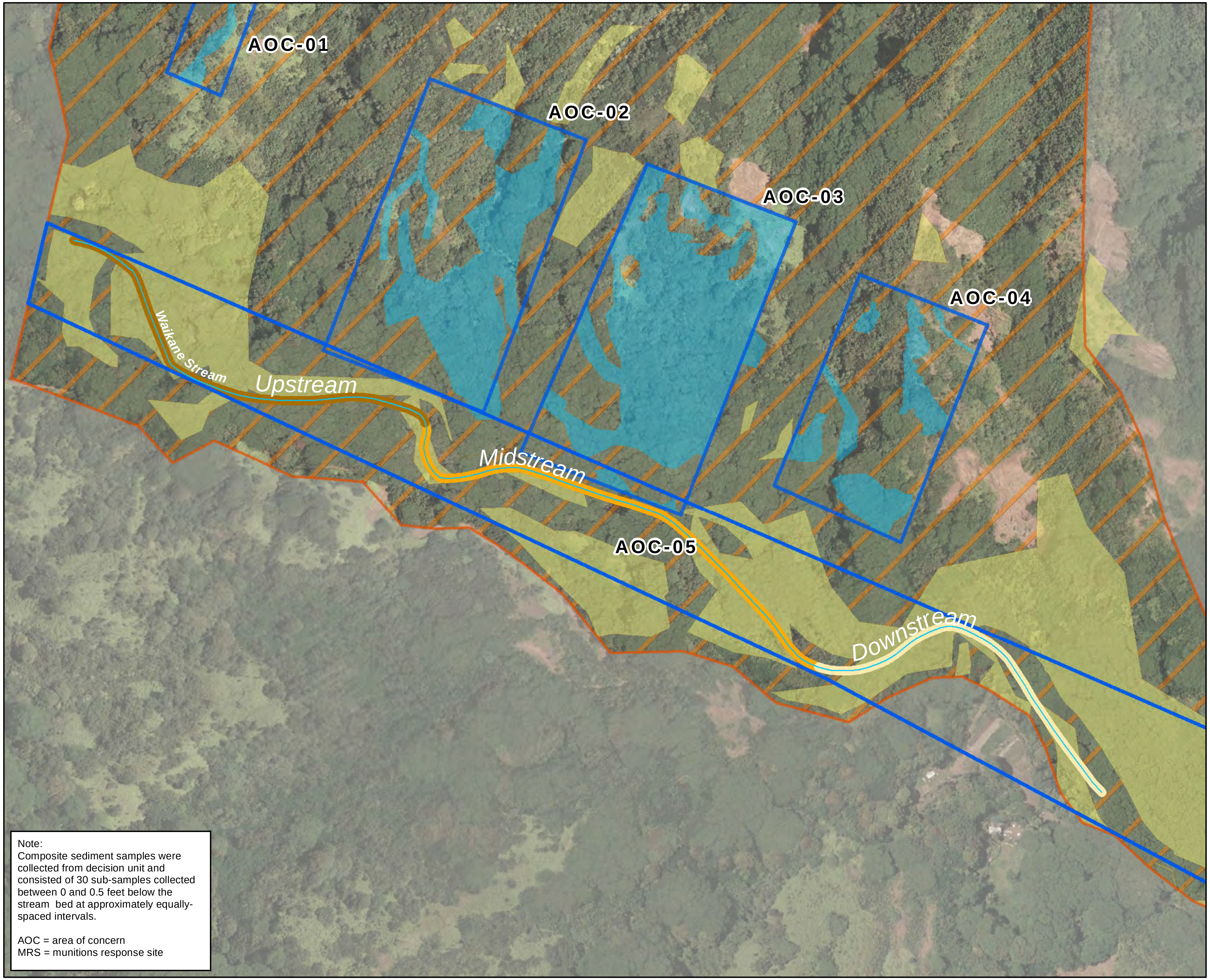
Legend

- Subsurface Soil Sampling Location
- Decision Units
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (< 30 Degree Slope)
- Area of Concern
- Waikane Stream
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 300 feet		Rev: 1
Checked By: SC	Date Drawn: 07/19/10		
Submitted By: JC	Revision Date: 10/01/10		
	Path:		



Note:
Composite sediment samples were collected from decision unit and consisted of 30 sub-samples collected between 0 and 0.5 feet below the stream bed at approximately equally-spaced intervals.

AOC = area of concern
MRS = munitions response site

N

250 125 0 250
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 3-10

Sediment Sample Locations

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

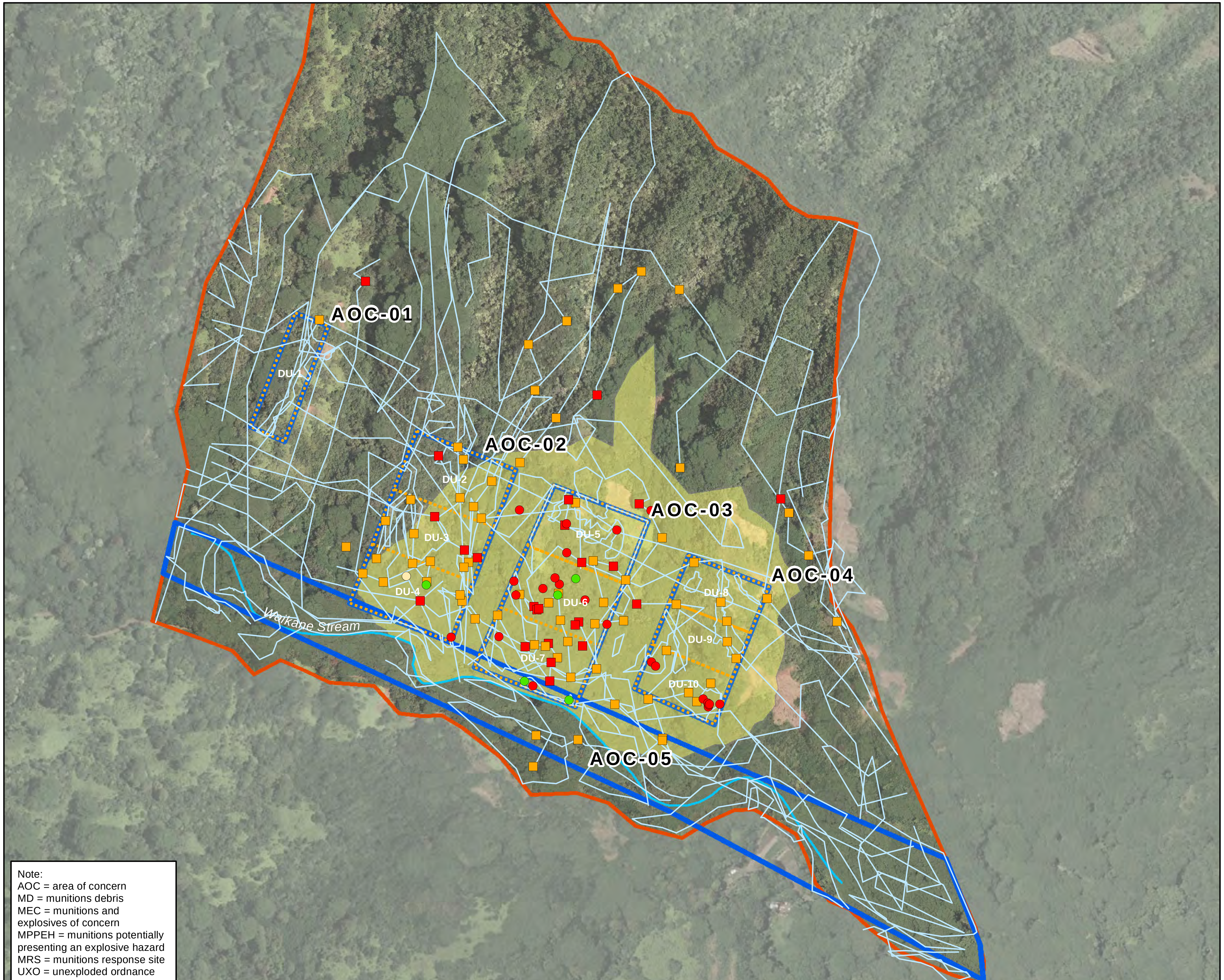
- Upstream Decision Unit
- Midstream Decision Unit
- Downstream Decision Unit
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (< 30 Degree Slope)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 250 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/01/10	
	Path:	

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG3-10_SEDIMENT.MXD RMANGAN 7/19/2010 13:09:18



N

400 200 0 400

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 4-1

MEC Concentration Areas

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

SI MEC/MD Items
- MD
- UXO

RI MEC Items
- DMM
- MPPEH
- UXO

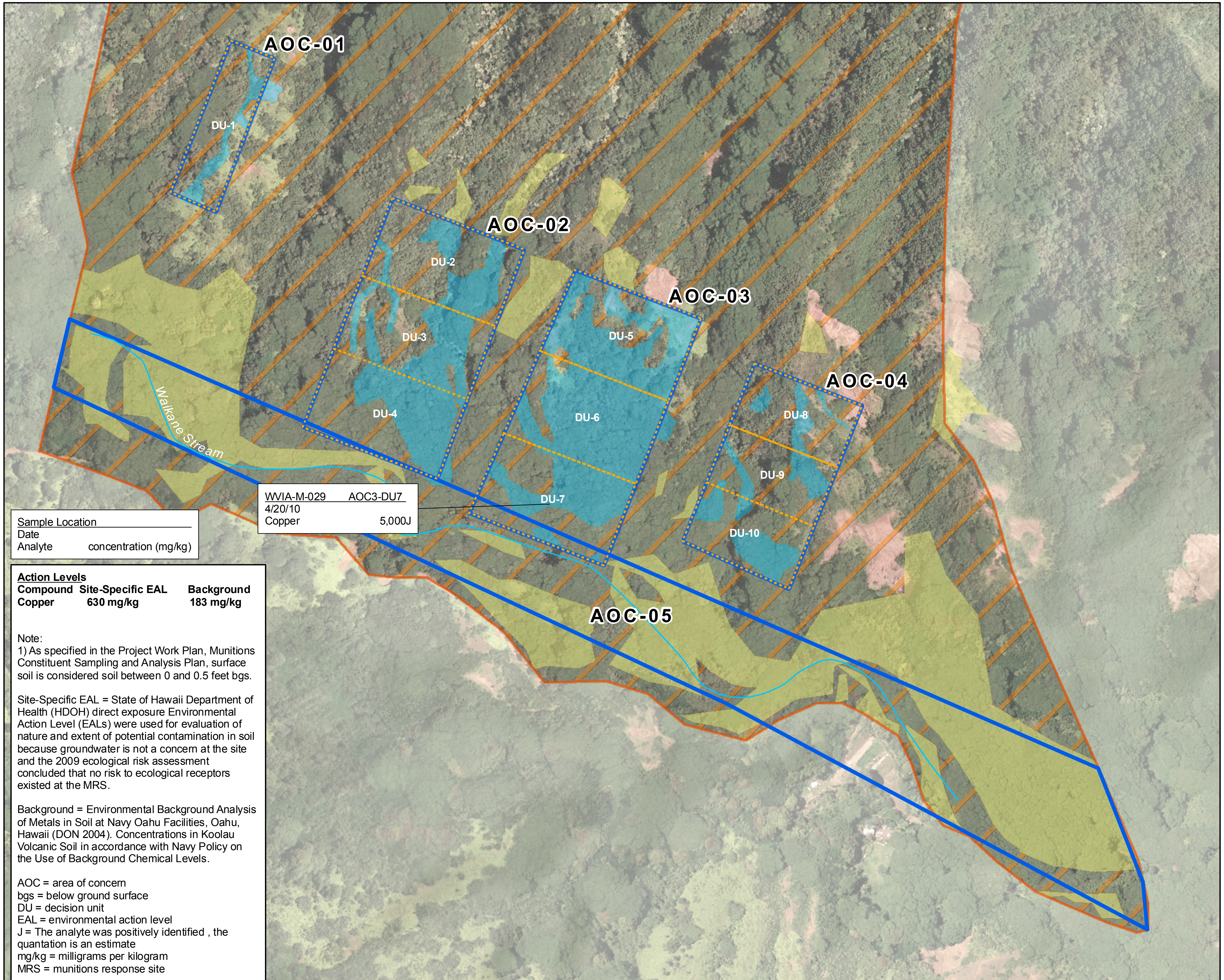
- SI/RI Traversed Track (13.1 ac.)
- Decision Units
- Approximate Munitions Concentrations Area
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 400 feet		Rev: 1
Checked By: SC	Date Drawn: 07/16/10		
Submitted By: JC	Revision Date: 10/01/10		
	Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG4-1_MEC_CONCENTRATION.MXD RMANGAN 7/19/2010 14:34:41



Action Levels

Compound	Site-Specific EAL	Background
Copper	630 mg/kg	183 mg/kg

Note:
1) As specified in the Project Work Plan, Munitions Constituent Sampling and Analysis Plan, surface soil is considered soil between 0 and 0.5 feet bgs.

Site-Specific EAL = State of Hawaii Department of Health (HDOH) direct exposure Environmental Action Level (EALs) were used for evaluation of nature and extent of potential contamination in soil because groundwater is not a concern at the site and the 2009 ecological risk assessment concluded that no risk to ecological receptors existed at the MRS.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii (DON 2004). Concentrations in Koolau Volcanic Soil in accordance with Navy Policy on the Use of Background Chemical Levels.

AOC = area of concern
bgs = below ground surface
DU = decision unit
EAL = environmental action level
J = The analyte was positively identified , the quantation is an estimate
mg/kg = milligrams per kilogram
MRS = munitions response site

N

300 150 0 300

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 4-2

Surface/Multi-Increment Soil Sample Exceedances

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

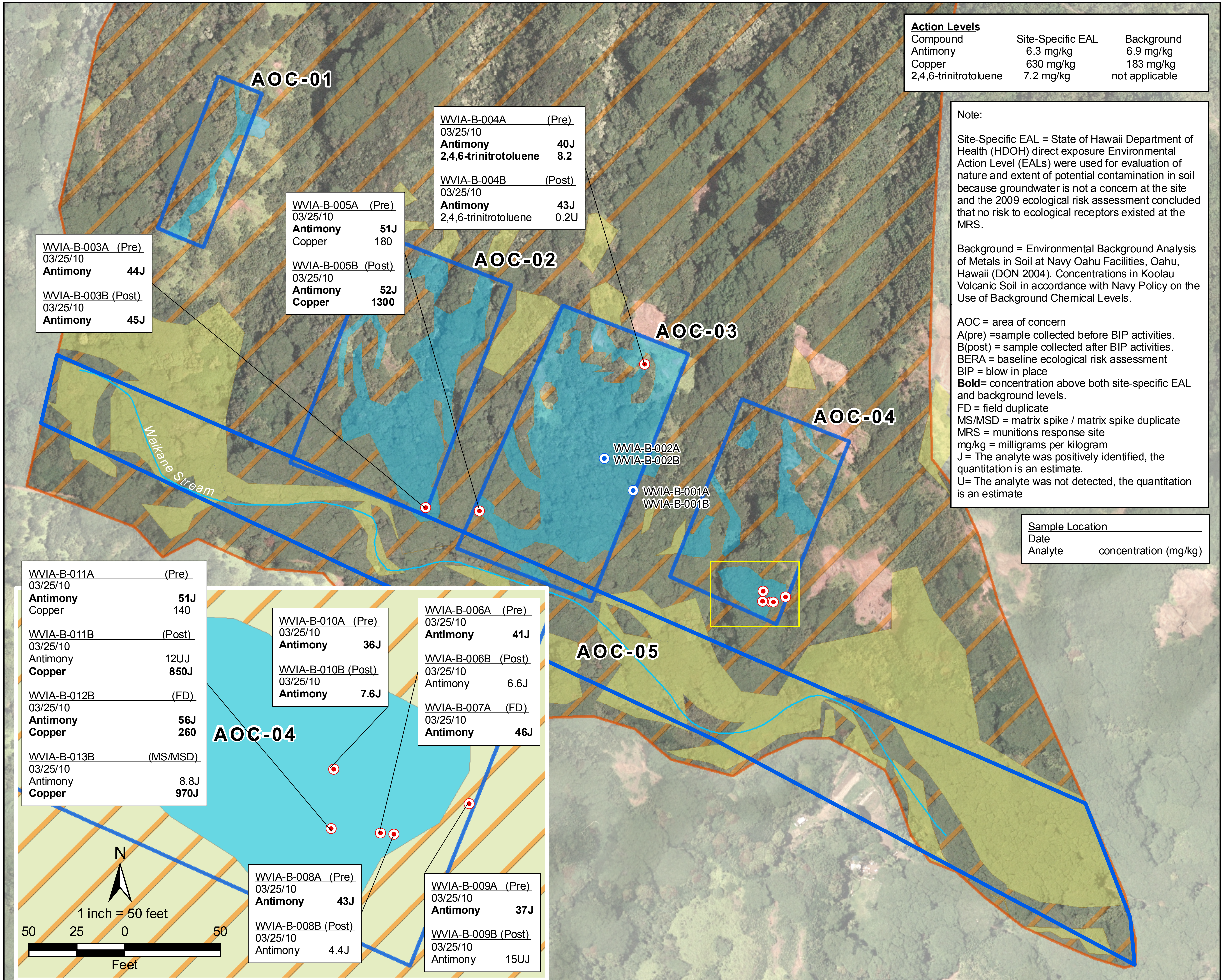
Legend

- Decision Units
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (< 30 Degree Slope)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

Drawn By: RM	Scale: 1 inch = 300 feet		Rev: 1
Checked By: SC	Date Drawn: 07/19/10		
Submitted By: JC	Revision Date: 10/01/10		
Path:			

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG4-2_SURFACE_EXCEEDANCES.MXD RMANGAN 7/19/2010 14:54:10



N
300 150 0 300
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 4-3
Impact on Surface Soil from Blow In Place (BIP) Activities

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

BIP Soil Sample Locations

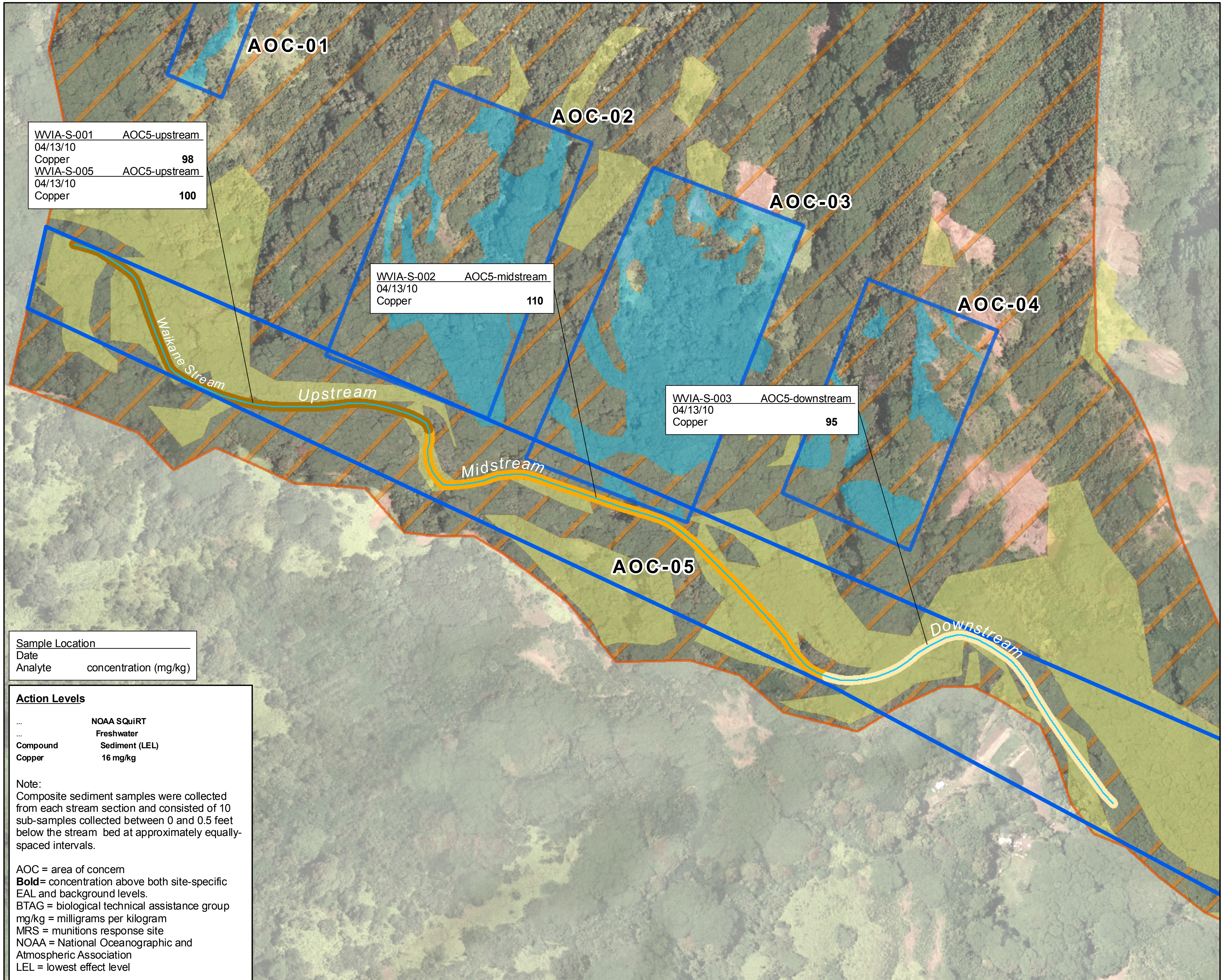
- No Exceedance Detected
- Exceedance Detected
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (> 30 Degree Area)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 300 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/04/10	
Path:		

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG4-3_BIP_EXCEEDANCES.MXD RMANGAN 7/19/2010 15:40:21



N

250 125 0 250

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 4-4

Sediment Sample Exceedances

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Upstream
- Midstream
- Downstream
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (<30 Degree Slope)
- Area of Concern
- Waikane MRS Boundary
- Waikane Stream

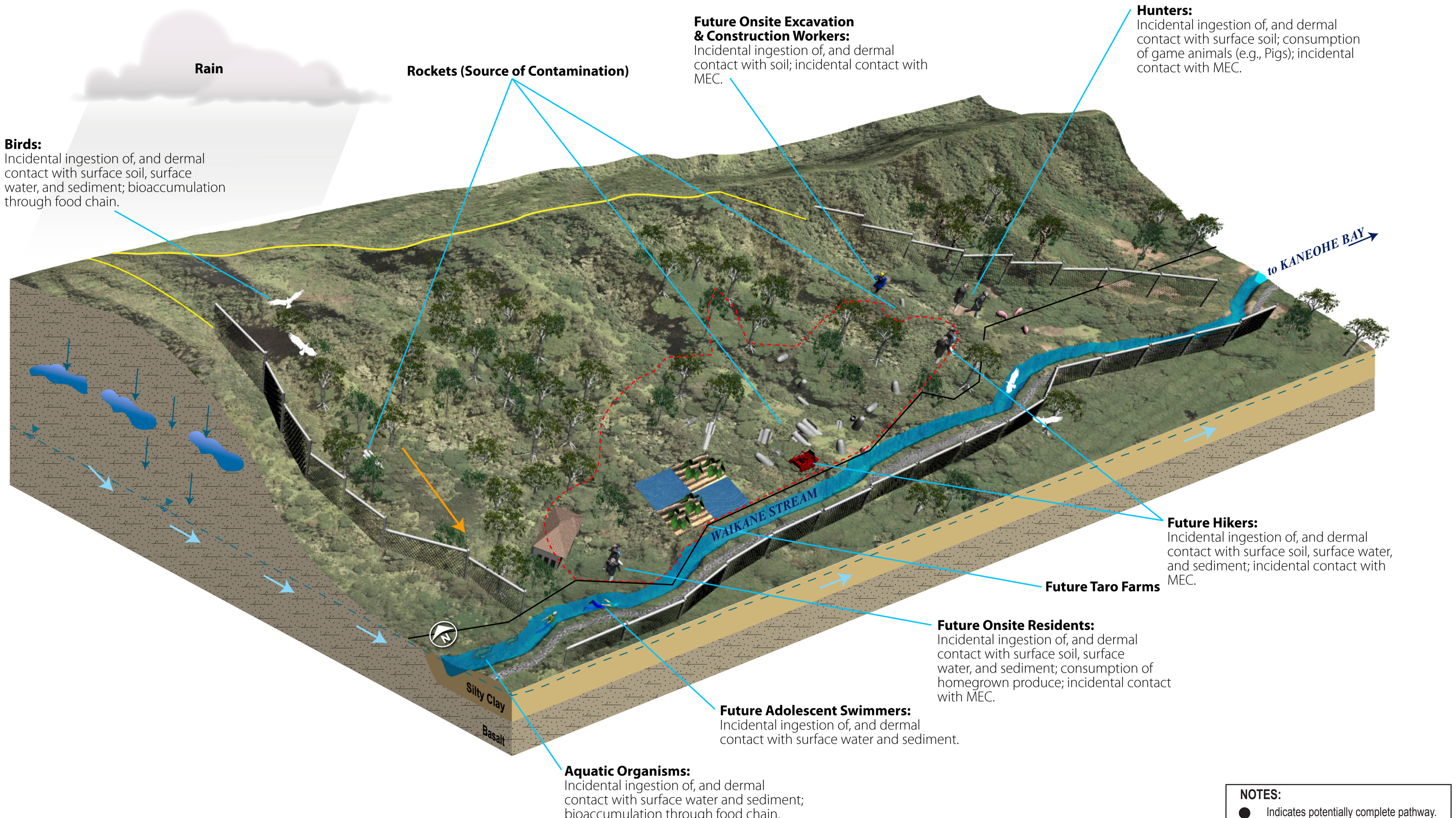
USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 250 feet	Rev: 1
Checked By: SC	Date Drawn: 07/19/10	
Submitted By: JC	Revision Date: 10/04/10	

Path:

Primary Source	Primary Release Mechanism	Secondary Source	Secondary Release Mechanism	Exposure Media	Exposure Route	Site Trespassers	Future Hikers/Swimmers (Recreational)	Future Excavation & Construction Workers	Future Residents	Aquatic & Terrestrial Eco Organisms
MEC from Military Firing Operations	MEC at Surface/Subsurface (down to 1 foot bgs)		Erosion/Run-off	MEC on Surface	Contact while Walking	●	●	●	●	○
	Explosion from Military Operations	Soil	Corrosion and Degradation	Surface Soil	Ingestion	●	●	●	●	●
					Inhalation	●	●	●	●	○
					Dermal Contact	●	●	●	●	●
			Erosion/Run-off	Surface Water/Sediment	Ingestion	●	●	○	○	●
					Dermal Contact	●	●	○	○	●
			Leaching	Perched Groundwater	Ingestion	○	○	○	○	○
					Dermal Contact	○	○	○	○	○



NOTES:
- ● Indicates potentially complete pathway.
- ○ Indicates an incomplete pathway.
- → Primary pathway.

Figure not drawn to scale

Figure 4-5

Conceptual Site Model

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

LEGEND

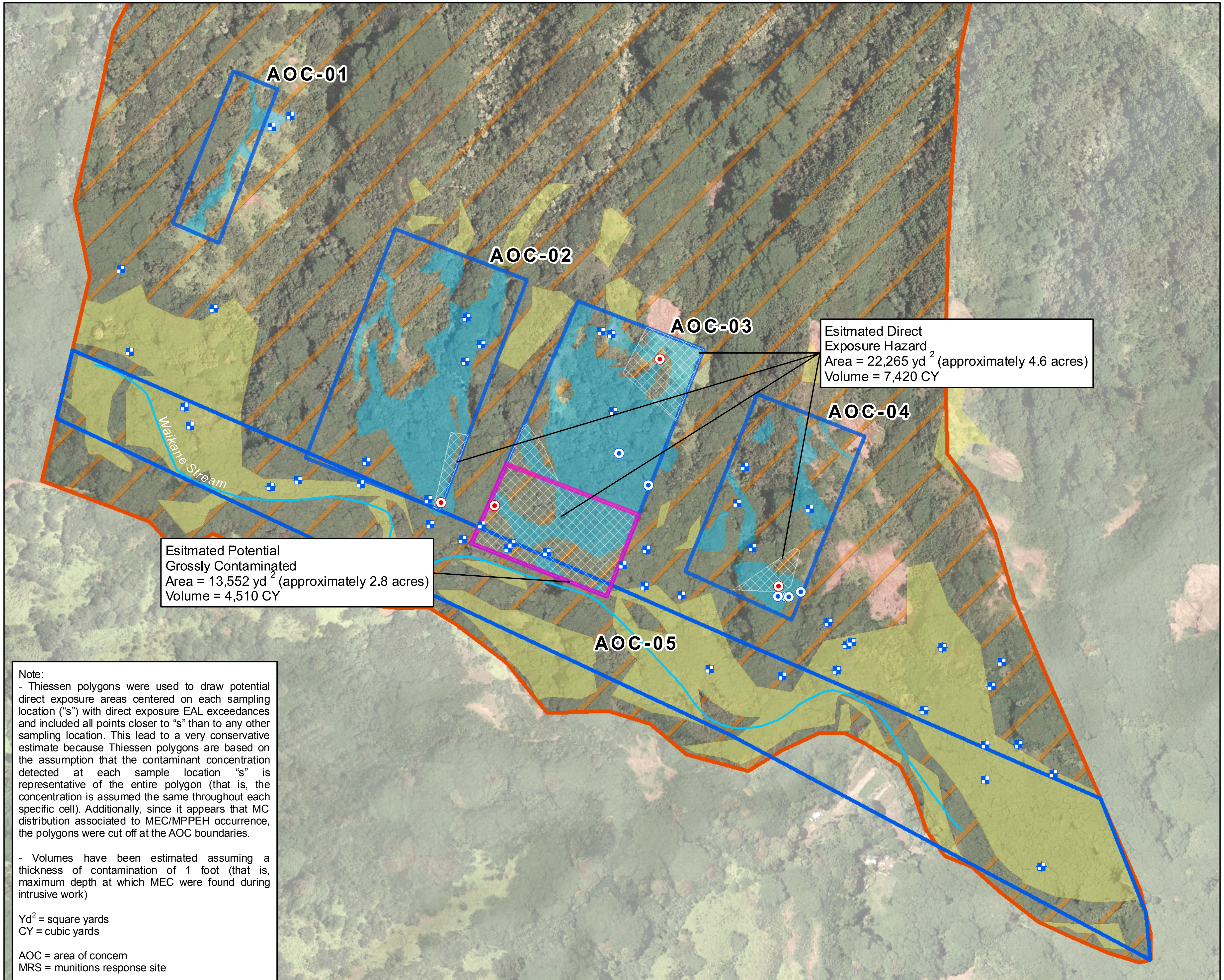
- Groundwater Flow Direction
- Infiltration
- Surface Runoff/Erosion
- Basal Groundwater Table
- Perched Groundwater
- Site Boundary
- MEC Munitions and Explosives of Concern
- Approximate Munitions Concentration Area
- Area south of this line could be suitable for potential unrestricted future land use

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM/MB	Scale:		Rev:
Checked By: SC	Date Drawn: 07/19/10		
Submitted By: JC	Revision Date:		
	Path:		

\\Nala\proj\USAEnvironmental\390801waikaneValleyR\GIS\Graphics\Fig4-5_CSM\Fig4-5_CSM.ai RMANGAN 07/20/10



Note:

- Thiessen polygons were used to draw potential direct exposure areas centered on each sampling location ("s") with direct exposure EAL exceedances and included all points closer to "s" than to any other sampling location. This lead to a very conservative estimate because Thiessen polygons are based on the assumption that the contaminant concentration detected at each sample location "s" is representative of the entire polygon (that is, the concentration is assumed the same throughout each specific cell). Additionally, since it appears that MC distribution associated to MEC/MPPEH occurrence, the polygons were cut off at the AOC boundaries.

- Volumes have been estimated assuming a thickness of contamination of 1 foot (that is, maximum depth at which MEC were found during intrusive work)

Yd^2 = square yards
CY = cubic yards

AOC = area of concern
MRS = munitions response site

N

300 150 0 300

Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 5-1

Environmental Hazard Evaluation Map

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

BIP Soil Sample Locations

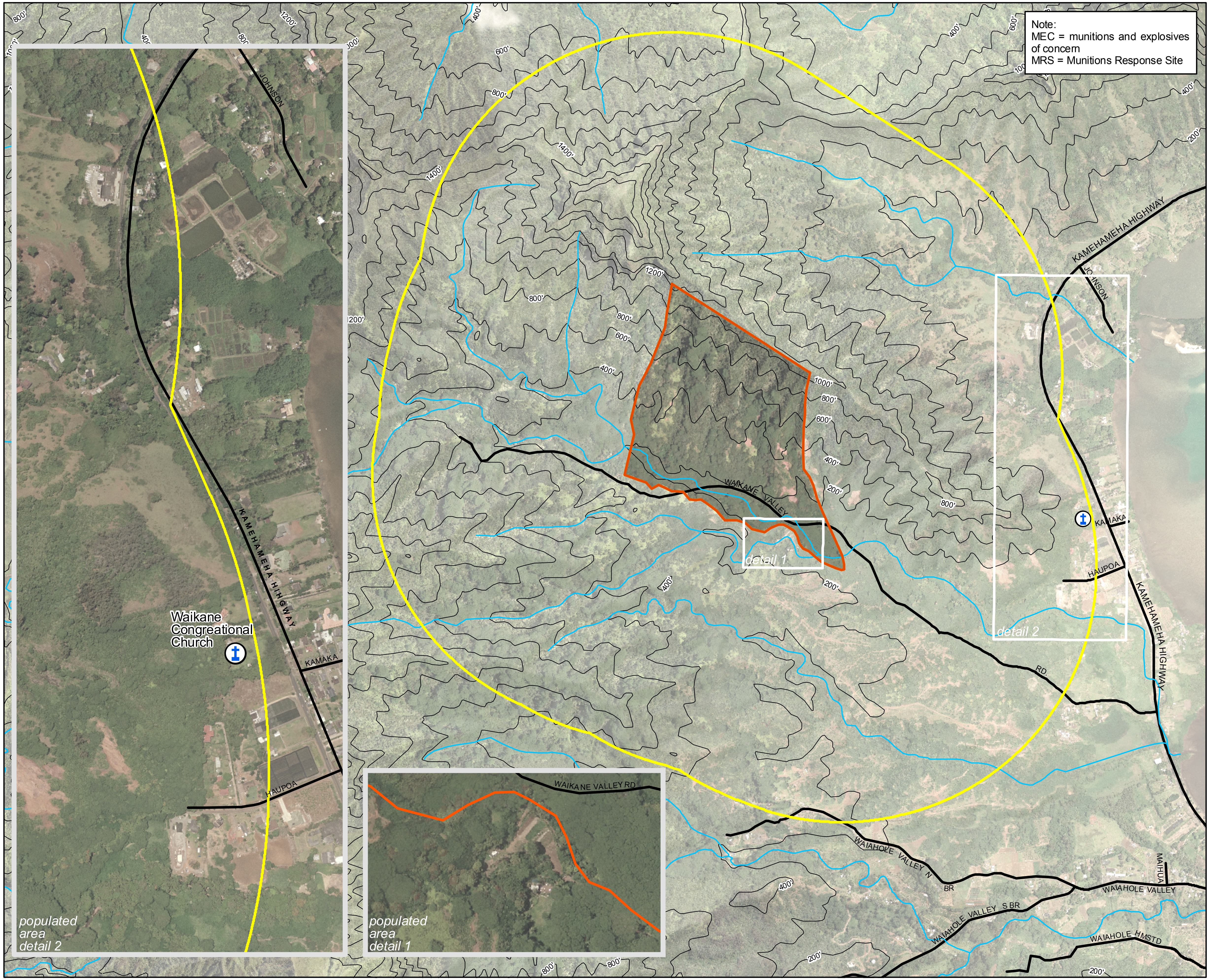
- No Exceedance Detected
- Exceedance Detected
- 2008 SI Soil Sample Location
- Potential Direct Exposure Hazard Area
- Potential Gross Contamination Hazard Area
- >30 Degree Slope Area
- < 30 Degree Slope Area
- Cleared Area (<30 Degree Slope)
- Area of Concern
- Waikane Stream
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 300 feet	Rev: 1
Checked By: SC	Date Drawn: 07/16/10	
Submitted By: JC	Revision Date: 10/01/10	
	Path:	

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG5-1_ENVIROHAZARD.MXD RMANGAN 7/20/2010 16:42:25



N

1,500 750 0 1,500
Feet

Data is projected to the State Plane Coordinate System: Hawaii 3 Zone, NAD83, Units in Feet.

Figure 6-1

Features Relevant to the MEC Hazard Assessment

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

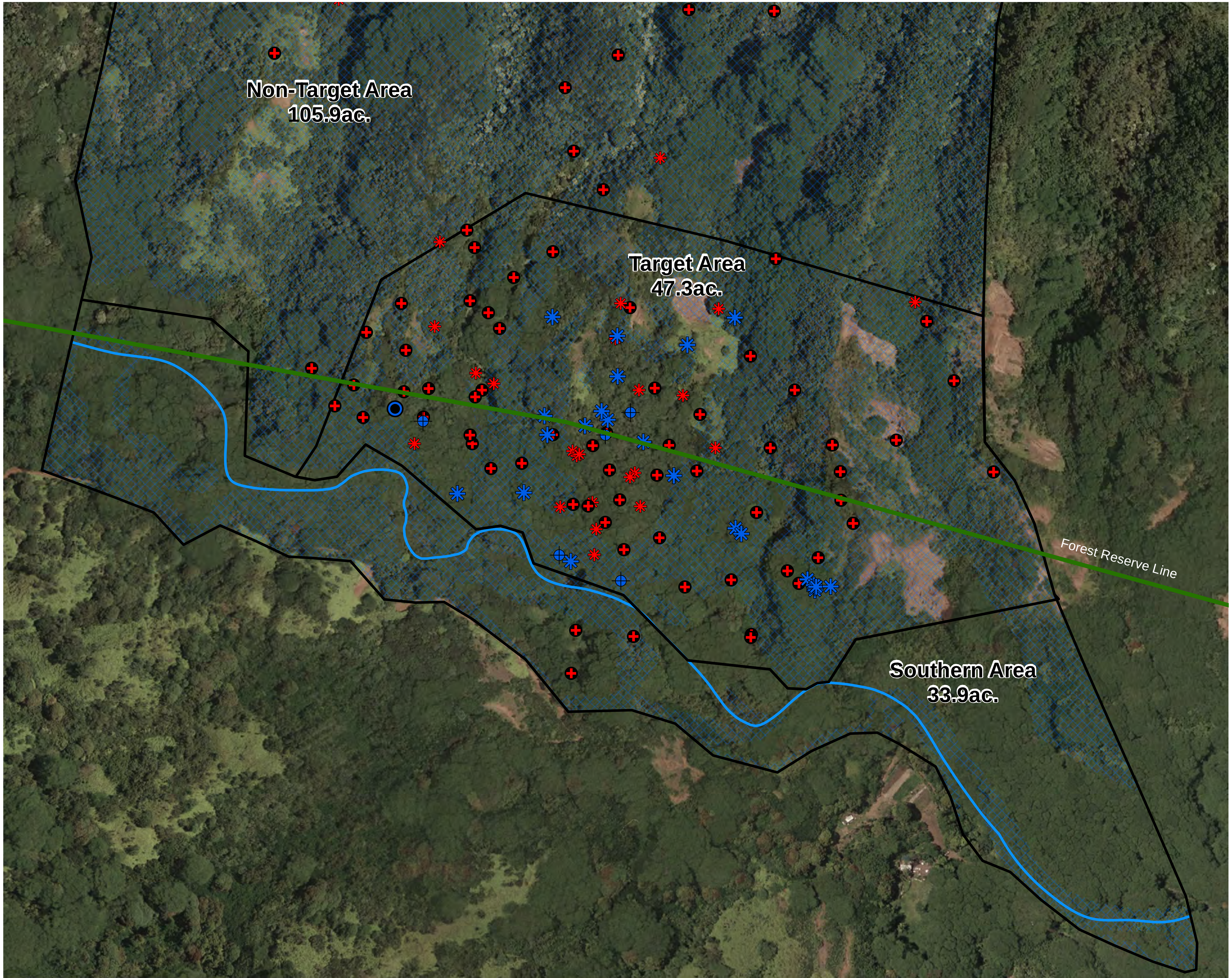
- Road
- 200 ft Contour Line
- 4000 ft. MRS distance
- Waikane MRS Boundary & Fence
- Stream

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By: RM	Scale: 1 inch = 1,500 feet	Rev: 1	
Checked By: SC	Date Drawn: 10/04/10		
Submitted By: JC	Revision Date:		
Path:			

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\FIG6-1_BOUNDARY.MXD RMANGAN 7/20/2010 12:36:55



N

290 145 0 290

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

Figure 8-1

Areas Defined for Feasibility Study

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

2010 RI MEC Items

- DMM Point
- MPPEH Point
- MEC (UXO) Point

2008 SI MEC Items

- Munitions Debris Point
- MEC (UXO) Point
- Alternative fence line
- Waikane Boundary
- Waikane Stream
- > 30 Degree Slope Area

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By:	SPC	Scale:	1 inch = 290 feet	Rev:
Checked By:	DM	Date Drawn:	3-08-2011	
Submitted By:	RN	Revision Date:		

Path:
S:\Waikane\RIFS Status Maps\
Land Use Map.mxd

TABLES

TABLE 3-1
Summary of Surface Clearance Activities
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Area of Concern (AOC)	Days to Clear	Estimated Cleared Area (acres)	Estimated >30 Degree Slopes (acres)	Total Area (acres)
AOC-01	1	0.4	1.4	1.8
AOC-02	2	3.4	4.5	7.9
AOC-03	12	5.8	2.7	8.5
AOC-04	2	1.4	4.5	5.9
Total	**17**	**11.0**	**13.1**	**24.1**

Notes:
AOC = area of concern

TABLE 3-2
Description of MEC/MPPEH Found During Surface Clearance
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

AOC	Description	Quantity	Type	Disposition
AOC-01	None			
AOC-02	60 mm mortar, nose fuze sheared off, item acceptable to move.	1	MPPEH	Consolidated with items in AOC-03 Consolidation Shot for explosive disposal. (confirmed HE)
	M28, HEAT Rifle Grenade	1	UXO	BIP (confirmed HE)
	M030 military demolition charge (TNT)	¼ pound	DMM	Consolidated with items in AOC-03 for explosive disposal. (confirmed HE)
AOC-03	3.5″ AT rocket with intact warhead, unknown filler, rocket motor fired, acceptable to move.	65	MPPEH	Consolidated within AOC-03 for explosive disposal/venting (1 item confirmed HE)
	3.5″ AT rocket warhead, small amount of white phosphorus filler.	1	MPPEH	Small amount of white phosphorus filler allowed to burn itself out. Item demilitarized during explosive venting operations.
	2.36″ rocket warhead, HEAT, no fuze, no rocket motor	4	MPPEH	Consolidated within AOC-03 for explosive disposal/venting (all confirmed HE)
	M9 HEAT Rifle Grenade, warhead only	1	MPPEH	Consolidated within AOC-03 for explosive disposal/venting (confirmed HE)
	M30, practice hand grenade, fuze sheared off	1	MPPEH	Consolidated within AOC-03 for explosive disposal/venting (confirmed Black Powder/Low Explosive charge)
	2.36″ rocket, HEAT, fuze intact, rocket motor fired	4	UXO	BIP (3 confirmed HE)
	2.36″rocket HEAT warhead with fuze intact, no rocket motor.	1	UXO	BIP (confirmed HE)
	3.5″ rocket, HEAT, fuze intact, rocket motor fired	9	UXO	BIP (all confirmed HE)
	M28 HEAT Rifle Grenade	1	UXO	BIP (confirmed HE)

AOC-04	M28 HEAT Rifle Grenade	7	UXO	BIP (all confirmed HE)

Notes:

AOC = area of concern
BIP = blow in place
HE = high explosive
AT = anti tank
HEAT = high explosive anti tank
MEC = munitions and explosives of concern
MPPEH = material potentially presenting an explosive hazard
TNT = trinitrotoluene
UXO = unexploded ordnance
DMM = discarded military munition

TABLE 3-3

Summary of MEC, MPPEH, and MDAS found during Remedial Investigation

	Surface Clearance			Intrusive Operations		
AREA	**MEC**	**MPPEH**	**MDAS (lb)**	**MEC**	**MPPEH**	**MDAS (lb)**
AOC-1	0	0	0	0	0	2
AOC-2	2	1	665	0	0	128
AOC-3	15	90	3265	0	1	282
AOC-4	8	0	200	1	0	90
AOC-5	0	0	0	0	0	0
TOTALS	**25**	**91**	**4130**	**1**	**1**	**502**

Notes:

AOC = area of concern MEC = munitions and explosives of concern

MPPEH = material potentially presenting an explosive hazard

MDAS = material documented as safe

TABLE 3-4
Summary of Findings of Intrusive Operations Conducted at AOCs
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Grid ID	# of Excavations	MEC/MPPEH	Depth* (inch bgs)	MD (pounds)	Description
AOC-01					
AOC1-1	1	NONE	NA	0	NONE
AOC1-2	5	NONE	NA	0	Small arms (ball).
AOC1-3	2	NONE	NA	2	Small arms (ball).
AOC-02					
AOC2-1	41	NONE	NA	25	Several parts and pieces from 3.5-inch rockets.
AOC2-2	39	NONE	NA	40	Several large fragments from 3.5-inch rockets.
AOC2-3	12	NONE	NA	3	One large fragment from 3.5-inch rocket.
AOC2-4	14	NONE	NA	10	Several large fragments from 3.5-inch rockets.
AOC2-5	2	NONE	NA	2	One piece of a 75-millimeter projectile.
AOC2-6	5	NONE	NA	None	NONE
AOC2-7	2	NONE	NA	1	One large fragment from 3.5-inch rocket.
AOC2-8	1	NONE	NA	None	NONE
AOC-03					
AOC3-1	15	NONE	NA	7	Several large fragments of 3.5-inch rockets.
AOC3-2	13	NONE	NA	25	Several large fragments of 3.5-inch rockets, pieces of a 55-gallon drum.
AOC3-3	80	NONE	NA	135	Several large fragments from 2.36-inch and 3.5-inch rockets.
AOC3-4	72	MPPEH Item. 2.36" rocket fuze and detonator attached to fired rocket motor, no warhead.	1	55	Several large fragments of 3.5-inch rockets, one 60-millimeter mortar fin, several large fragments of 75-millimeter projectiles.
AOC3-5	26	NONE	NA	20	Several large fragments of 3.5-inch rockets, one 60-millimeter mortar fin, several large fragments of 75-millimeter projectiles.
AOC3-6	26	NONE	NA	20	Two 3.5-inch practice rockets.
AOC3-7	15	NONE	NA	0	No MD recovered in this Grid.
AOC3-8	17	NONE	NA	20	Two 3.5-inch practice rockets, two 3.5-inch rocket motors.

TABLE 3-4
Summary of Findings of Intrusive Operations Conducted at AOCs
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Grid ID	# of Excavations	MEC/MPPEH	Depth* (inch bgs)	MD (pounds)	Description
AOC-04					
AOC4-1	45	NONE	NA	10	One 3.5-inch rocket motor, one M29 practice rifle grenade, several large fragments of a M29 practice rifle grenade.
AOC4-2	10	NONE	NA	10	One 3.5-inch practice rocket.
AOC4-3	26	NONE	NA	35	One 3.5-inch practice rocket, one 3.5-inch rocket motor, one large fragment from a 60-millimeter mortar.
AOC4-4	3	NONE	NA	NONE	NONE
AOC4-5	6	NONE	NA	NONE	NONE
AOC4-6	21	MEC Item. M28, HEAT, rifle grenade	1	35	Seven 3.5-inch rocket motors, one large fragment of a 75-millimeter projectile.

Notes:
*Depth of MEC/MPPEH. MD items were found at depths ranging between 1 and 28 inches bgs.

AOC = Area of Concern
bgs = below ground surface
MD = munitions debris
MEC = munitions and explosives of concern
MPPEH = material potentially presenting explosive hazard
NA = not applicable

TABLE 3-5

Summary of Findings of Intrusive Operations Conducted at AOC-5 – Transects Area

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Transect ID	Target ID	ITEM
AOC5-1	T-1	Surveyor hub
	T-2	Control seed
	T-3	Quality control seed
AOC5-2	No Targets	
AOC5-3	T-1	Control seed
	T-2	Quality control seed
AOC5-4	T-1	Control seed
	T-2	Quality control seed

TABLE 3-6
Summary of Explosive Disposal Activities
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Date	Area	Type of Shot	Quantity	Demolition Supply	MD Generated (pounds)
3/18/10	AOC-03	1 demonstration for RAB members	1 rocket (3.5 inch)	ED = 2 DC = 10 feet P = 1	15
3/25/10	AOC-03	1 BIP shot	2 rocket warheads (2.36 inch)	ED = 2 DC = 20 feet P = 2	15
3/30/10	AOC-03	1 consolidated 2 BIPs	– 65 rockets (3.5 inch) + 1 M29 rifle grenade – – 6 HEAT rockets (2.36 inch) and 1 HEAT rocket warhead (3.5 inch)	ED = 6 DC = 430 feet P = 66	950
4/01/10	AOC-03	1 BIP/consolidated 1 BIP	– 1 HEAT rocket (2.36 inch) + 1 M9 rifle grenade – 1 HEAT rocket (2.36 inch)	ED = 4 DC = 20 feet P = 3	20
4/15/10	AOC-02 AOC-03 AOC-04	1 BIP 1 BIP/consolidated (from AOC2) 1 consolidated 2 BIP	– 1 M28 HEAT rifle grenade – 1 HEAT rocket (3.5 inch) + 1 60mm mortar – 1 M28 HEAT rifle grenade + ¼ pound TNT demolition block + 1 M30 practice grenade – 6 M28 HEAT rifle grenades +1 M29 practice rifle grenade – 1 M28 HEAT rifle grenade	ED = 10 DC = 150 feet P = 13	40
4/29	AOC-02 /AOC-03 AOC-03 AOC-04	1 BIP/consolidated 1 BIP/consolidated 1 BIP	– 1 HEAT rocket warhead (2.36 inch) + 60mm mortar + 3 bases of 75mm projectiles – 1 rocket (3.5 inch) + 1 rocket motor (2.36 inch) – 1 M28 rifle grenade	ED = 6 DC = 95 feet P = 5	45

Notes:

BIP = blown in place
ED = electric detonator
DC = 80-grain detonating cord
HE = highly explosive

TABLE 3-7

Samples Collected and Analytical Plan for the Munition Response Site

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

					Analytical Methods			
Sample ID	Sample Type	Sample Depth	Depth Units	Sample Date	Metals 6010B	Metals 7470A	Explosives 8330	Moisture D2216
Surface Soil (Multi-Increment Sampling)								
WVIA-M-001	N	0-6	IN	19-Apr-10	X			
WVIA-M-002	N	0-6	IN	19-Apr-10	X			
WVIA-M-003	N	0-6	IN	19-Apr-10	X			
WVIA-M-004	N	0-6	IN	19-Apr-10	X			
WVIA-M-005	N	0-6	IN	19-Apr-10	X			
WVIA-M-006	N	0-6	IN	19-Apr-10	X			
WVIA-M-007	N	0-6	IN	19-Apr-10	X			
WVIA-M-008	N	0-6	IN	19-Apr-10	X			
WVIA-M-009	N	0-6	IN	19-Apr-10	X			
WVIA-M-010	N	0-6	IN	19-Apr-10	X			
WVIA-M-011	N	0-6	IN	19-Apr-10	X			
WVIA-M-012	N	0-6	IN	19-Apr-10	X			
WVIA-M-013	N	0-6	IN	20-Apr-10	X			
WVIA-M-014	N	0-6	IN	20-Apr-10	X			
WVIA-M-015	N	0-6	IN	20-Apr-10	X			
WVIA-M-016	N	0-6	IN	20-Apr-10	X			
WVIA-M-017	N	0-6	IN	20-Apr-10	X			
WVIA-M-018	N	0-6	IN	20-Apr-10	X			
WVIA-M-019	N	0-6	IN	20-Apr-10	X			
WVIA-M-020	N	0-6	IN	20-Apr-10	X			
WVIA-M-021	N	0-6	IN	20-Apr-10	X			
WVIA-M-022	N	0-6	IN	20-Apr-10	X			
WVIA-M-023	N	0-6	IN	20-Apr-10	X			
WVIA-M-024	N	0-6	IN	20-Apr-10	X			
WVIA-M-025	N	0-6	IN	20-Apr-10	X			
WVIA-M-026	N	0-6	IN	20-Apr-10	X			
WVIA-M-027	N	0-6	IN	20-Apr-10	X			
WVIA-M-028	N	0-6	IN	20-Apr-10	X			
WVIA-M-029	N	0-6	IN	20-Apr-10	X			
WVIA-M-030	N	0-6	IN	20-Apr-10	X			
Surface Soil (Blow in Place)								
WVIA-B-001A	N	0-2	IN	25-Mar-10	X		X	
WVIA-B-001B	N	0-2	IN	25-Mar-10	X		X	
WVIA-B-002A	N	0-2	IN	25-Mar-10	X		X	
WVIA-B-002B	N	0-2	IN	25-Mar-10	X		X	
WVIA-B-003A	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-003B	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-004A	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-004B	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-005A	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-005B	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-006A	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-006B	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-007A	FD	0-2	IN	15-Apr-10	X		X	X
WVIA-B-008A	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-008B	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-009A	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-009B	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-010A	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-010B	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-011A	N	0-2	IN	15-Apr-10	X		X	X
WVIA-B-011B	N	0-2	IN	15-Apr-10	X		X	X

TABLE 3-7

Samples Collected and Analytical Plan for the Munition Response Site

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

					Analytical Methods			
Sample ID	**Sample Type**	**Sample Depth**	**Depth Units**	**Sample Date**	**Metals 6010B**	**Metals 7470A**	**Explosives 8330**	**Moisture D2216**
WVIA-B-012B	FD and MS/MSD	0-2	IN	15-Apr-10	X		X	X
WVIA-B-013B	MS/MSD	0-2	IN	15-Apr-10	X		X	X
Subsurface Soil								
WVIA-SS-001	N and MS/MSD	2	FT	26-Apr-10	X			
WVIA-SS-002	N	3	FT	26-Apr-10	X			
WVIA-SS-003	N	2	FT	26-Apr-10	X			
WVIA-SS-004	N	3	FT	26-Apr-10	X			
WVIA-SS-005	N	2	FT	26-Apr-10	X			
WVIA-SS-006	N	3	FT	26-Apr-10	X			
WVIA-SS-007	N	2	FT	26-Apr-10	X			
WVIA-SS-008	N	3	FT	26-Apr-10	X			
WVIA-SS-009	N	2	FT	26-Apr-10	X			
WVIA-SS-010	N	3	FT	26-Apr-10	X			
WVIA-SS-011	N	2	FT	26-Apr-10	X			
WVIA-SS-012	N	3	FT	26-Apr-10	X			
WVIA-SS-013	FD	3	FT	26-Apr-10	X			
WVIA-SS-014	N	2	FT	26-Apr-10	X			
WVIA-SS-015	N	3	FT	26-Apr-10	X			
WVIA-SS-016	N	2	FT	27-Apr-10	X			
WVIA-SS-017	N	3	FT	27-Apr-10	X			
WVIA-SS-018	N	2	FT	27-Apr-10	X			
WVIA-SS-019	BK	2	FT	27-Apr-10	X	X		
WVIA-SS-020	N	2	FT	27-Apr-10	X			
WVIA-SS-021	N	3	FT	27-Apr-10	X			
WVIA-SS-022	N	2	FT	27-Apr-10	X			
WVIA-SS-023	N	3	FT	27-Apr-10	X			
WVIA-SS-024	FD	3	FT	27-Apr-10	X			
WVIA-SS-026	BK	0-0.5	IN	5-May-10	X			
Sediment								
WVIA-S-001	N	0-6	IN	13-Apr-10	X	X	X	X
WVIA-S-002	N	0-6	IN	13-Apr-10	X	X	X	X
WVIA-S-003	N	0-6	IN	13-Apr-10	X	X	X	X
WVIA-S-004	FD	0-6	IN	13-Apr-10	X	X	X	X
WVIA-S-005	N	0-6	IN	13-Apr-10	X	X	X	X

Notes:

BK = background
FD = field duplicate sample
FT = feet
MS/MSD = matrix spike/matrix spike duplicate
IN = inches
N = normal sample

TABLE 4-1

Summary of Detected Results for Metals in Surface Soil (Multi-Increment Sampling)

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

												HDOH DE EAL		Background	
Location ID	Chemical Group	Analyte	Unit	Number of Detects	Number of Samples	Frequency of Detection	Minimum MDL	Maximum MDL	Minimum Detected Value	Maximum Detected Value	EAL	Number of Detects > EAL	Number of Nondetects > EAL	Background	Number of Detects > Value	Number of Nondetects > Value
AOC-01	METAL	Lead	mg/kg	3	3	100%	--	--	6	10	400	--	--	27	--	--
	METAL	Copper	mg/kg	3	3	100%	--	--	60	70	630	--	--	183	--	--
AOC-02	METAL	Lead	mg/kg	9	9	100%	--	--	6.7	110	400	--	--	27	4	--
	METAL	Copper	mg/kg	9	9	100%	--	--	59	320	630	--	--	183	3	--
AOC-03	METAL	Lead	mg/kg	9	9	100%	--	--	22	140	400	--	--	27	7	--
	METAL	Copper	mg/kg	9	9	100%	--	--	65	5000	630	1	--	183	4	--
AOC-04	METAL	Lead	mg/kg	9	9	100%	--	--	5.6	33	400	--	--	27	1	--
	METAL	Copper	mg/kg	9	9	100%	--	--	61	150	630	--	--	183	--	--

Notes:

METAL = includes method SW6010B.
HDOH = State of Hawaii Department of Health
mg/kg = milligrams per kilogram
MDL = method detection limit

Minimum/Maximum MDL evaluations only consider non detected results.

HDOH DE EAL = State of Hawaii Department of Health Direct Exposure Environmental Action Level (HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than 150 meters from surface water.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii (Earth Tech, 2006). Concentrations in Koolau Volcanic Caprock Soil in accordance with Navy Policy on the Use of Background Chemical Levels.

(shaded) Detected result exceeds EAL or both EAL and Background if applicable.
-- No screening level available

TABLE 4-2

Data Results for Metals in Surface Soil (Multi-Increment Sampling)

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample Location AOC/DU	Sample Depth (inches)	Sample Date	Analyte	HDOH DE EAL (mg/kg)	Background (mg/kg)	Replicate Concentration (mg/kg) R1	R2	R3	Mean	STD	RSD%
AOC-01/DU1	0-6	19-Apr-10	Copper	630	183	64	70	60	65	5.0	8%
			Lead	400	27	6	10	6.2	7	2.3	33%
AOC-02/DU2	0-6	19-Apr-10	Copper	630	183	100	75 J	91	89	12.7	14%
			Lead	400	27	6.7	11	8.3	9	2.2	25%
AOC-02/DU3	0-6	19-Apr-10	Copper	630	183	180	59 J	160 J	133	64.9	**49%**
			Lead	400	27	36	7.5	17	20	14.5	**72%**
AOC-02/DU4	0-6	19-Apr-10	Copper	630	183	320	220 J	190 J	243	68.1	28%
			Lead	400	27	110	100	78	96	16.4	17%
AOC-03/DU5	0-6	20-Apr-10	Copper	630	183	69 J	96	65 J	77	16.9	22%
			Lead	400	27	22	24	28	25	3.1	12%
AOC-03/DU6	0-6	20-Apr-10	Copper	630	183	170 J	350	71 J	197	141.4	**72%**
			Lead	400	27	98	140	43	94	48.6	**52%**
AOC-03/DU7	0-6	20-Apr-10	Copper	630	183	350	**5000** J	250 J	1867	2714.0	**145%**
			Lead	400	27	130	130	100	120	17.3	14%
AOC-04/DU8	0-6	19-Apr-10	Copper	630	183	61	72	89	74	14.1	19%
			Lead	400	27	5.6	6.3	7.2	6	0.8	13%
AOC-04/DU9	0-6	20-Apr-10	Copper	630	183	81	150	97	109	36.1	33%
			Lead	400	27	7.7	6.7	33	16	14.9	**94%**
AOC-04/DU10	0-6	20-Apr-10	Copper	630	183	130 J	70 J	110	103	30.6	30%
			Lead	400	27	10	7.6	7.3	8	1.5	18%

Notes:

Three replicate samples (R1, R2, and R3) were collected from each AOC-DU listed in this table to statistically evaluate sampling precision and heterogeneity. These are indicated in the table by triplicates (for example, WVIA-M-001, WVIA-M-002, and WVIA-M-003) within the same AOC-DU (for example AOC1-DU1). Replicates sample IDs were as follows:

AOC-01/DU1 = R1 (WVIA-M-001); R2 (WVIA-M-002); R3 (WVIA-M-003)
AOC-02/DU2 = R1 (WVIA-M-004); R2 (WVIA-M-005); R3 (WVIA-M-006)
AOC-02/DU3 = R1 (WVIA-M-007); R2 (WVIA-M-008); R3 (WVIA-M-009)
AOC-02/DU4 = R1 (WVIA-M-010); R2 (WVIA-M-011); R3 (WVIA-M-012)
AOC-03/DU5 = R1 (WVIA-M-022); R2 (WVIA-M-023); R3 (WVIA-M-024)
AOC-03/DU6 = R1 (WVIA-M-025); R2 (WVIA-M-026); R3 (WVIA-M-027)
AOC-03/DU7 = R1 (WVIA-M-028); R2 (WVIA-M-029); R3 (WVIA-M-030)
AOC-04/DU8 = R1 (WVIA-M-013); R2 (WVIA-M-014); R3 (WVIA-M-015)
AOC-04/DU9 = R1 (WVIA-M-016); R2 (WVIA-M-017); R3 (WVIA-M-018)
AOC-04/DU10 = R1 (WVIA-M-019); R2 (WVIA-M-020); R3 (WVIA-M-021)

AOC = Area of Concern
DU = Decision Unit
HDOH = State of Hawaii Department of Health
mg/kg = milligrams per kilogram
N = normal sample
STD = standard deviation

J = The analyte was positively identified, the quantitation is an estimation.

HDOH DE EAL = State of Hawaii Department of Health Direct Exposure Environmental Action Level (HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than 150 meters from surface water.

RSD% = percent relative standard deviation (STD/Mean). HDOH suggests an RSD of 35% or less as reasonable error range for decision-making; the MC SAP (USAE, February 2009) indicates that levels of RSD of 50% or less are acceptable.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii (Earth Tech, 2006). Concentrations (95th percentile) in Koolau Volcanic Soil in accordance with Navy Policy on the Use of Background chemical levels.

Bold (grey shading) Detected result exceeds both HDH DE EAL and Background concentration.
Bold Detected result exceeds HDOH recommended value for RSD%.
Bold (orange shading) Detected result exceeds both HDOH and Munitions Compounds Sampling and Analysis Plan (USAE, February 2009) recommended value for RSD%..

TABLE 4-3

Summary of Detected Results for Explosive Compounds in Surface Soil (Blow in Place Sampling)

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

											HDOH DE EAL			Background		
Location ID	Chemical Group	Analyte	Unit	Number of Detects	Number of Samples	Frequency of Detection	Minimum MDL	Maximum MDL	Minimum Detected Value	Maximum Detected Value	EAL	Number of Detects > EAL	Number of Nondetects > EAL	Background	Number of Detects > Value	Number of Nondetects > Value
AOC-02	CONV	moisture content	pct	2	2	100%	--	--	46	52	--	--	--	--	--	--
	METAL	aluminum	mg/kg	2	2	100%	--	--	36,000	41,000	77000*	--	--	93,900	--	--
	METAL	antimony	mg/kg	2	2	100%	--	--	44	45	6.3	2	--	6.9	2	--
	METAL	barium/barium 140	mg/kg	2	2	100%	--	--	23	23	3100	--	--	181	--	--
	METAL	chromium	mg/kg	2	2	100%	--	--	230	240	500**	--	--	483	--	--
	METAL	copper	mg/kg	2	2	100%	--	--	220	300	630	--	--	183	2	--
	METAL	Iron	mg/kg	2	2	100%	--	--	99,000	110,000	55000*	2	--	177,000	--	--
	METAL	lead	mg/kg	2	2	100%	--	--	13	14	400	--	--	27	--	--
	METAL	nickel	mg/kg	2	2	100%	--	--	61	64	310	--	--	346	--	--
	METAL	zinc	mg/kg	2	2	100%	--	--	60	68	4700	--	--	197	--	--
AOC-03	CONV	moisture content	pct	4	4	100%	--	--	34	49	--	--	--	--	--	--
	METAL	aluminum	mg/kg	8	8	100%	--	--	36,000	57,000	77000*	--	--	93,900	--	--
	METAL	antimony	mg/kg	5	8	63%	0.83	1	4	52	6.3	4	--	6.9	4	--
	METAL	barium/barium 140	mg/kg	8	8	100%	--	--	21	58	3100	--	--	181	--	--
	METAL	chromium	mg/kg	8	8	100%	--	--	230	370	500**	--	--	483	--	--
	METAL	copper	mg/kg	8	8	100%	--	--	110	1,300	630	1	--	183	3	--
	METAL	Iron	mg/kg	8	8	100%	--	--	95,000	130,000	55000*	8	--	177,000	--	--
	METAL	lead	mg/kg	8	8	100%	--	--	15	300	400	0	--	27	6	--
	METAL	nickel	mg/kg	8	8	100%	--	--	61	160	310	1	--	346	--	--
	METAL	zinc	mg/kg	8	8	100%	--	--	54	280	4700	--	--	197	1	--
	NNC	2,4,6-trinitrotoluene	mg/kg	1	8	13%	0.2	0.21	8.2	8.2	7.2	1	--	--	--	--
AOC-04	CONV	moisture content	pct	13	13	100%	--	--	29	45	--	--	--	--	--	--
	METAL	aluminum	mg/kg	13	13	100%	--	--	33,000	65,000	77000*	--	--	93,900	--	--
	METAL	antimony	mg/kg	11	13	85%	12	15	4.4	56	6.3	10	2	6.9	9	2
	METAL	barium/barium 140	mg/kg	13	13	100%	--	--	21	72	3100	--	--	181	--	--
	METAL	chromium	mg/kg	13	13	100%	--	--	190	350	500**	--	--	483	--	--
	METAL	copper	mg/kg	13	13	100%	--	--	56	970	630	2	--	183	5	--
	METAL	Iron	mg/kg	13	13	100%	--	--	74,000	130,000	55000*	13	--	177,000	--	--
	METAL	lead	mg/kg	13	13	100%	--	--	5.7	280	400	0	--	27	4	--
	METAL	nickel	mg/kg	13	13	100%	--	--	57	140	310	--	--	346	--	--
	METAL	zinc	mg/kg	13	13	100%	--	--	71	170	4700	--	--	197	--	--
	NNC	2,4,6-trinitrotoluene	mg/kg	2	13	15%	0.19	0.21	0.2	0.37	7.2	--	--	--	--	--
	NNC	2-amino-4,6-dinitrotoluene	mg/kg	2	13	15%	0.19	0.21	0.25	0.28	31	--	--	--	--	--
	NNC	4-amino-2,6-dinitrotoluene	mg/kg	2	13	15%	0.19	0.21	0.25	0.3	31	--	--	--	--	--

Notes:

METAL = includes methods SW6010B and SW7470A
EXPL = explosives; includes method SW8330
CONV = conventional data; includes method D2216

Minimum/Maximum MDL evaluations only consider non detected results.

HDOH = State of Hawaii Department of Health
mg/kg = milligrams per kilogram

HDOH DE EAL = State of Hawaii Department of Health Direct Exposure Environmental Action Level (HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than 150 meters from surface water.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii (Earth Tech, 2006). Concentrations (95th percentile) in Koolau Volcanic Soil in accordance with Navy Policy on the Use of Background chemical levels.

*= Regional Screening Level (RSL), May 2010 EPA Residential (that is, no HDOH Tier 1 EAL available)

** = no DE EAL is available for chromium. The background level given by HDOH guidance is used

Detected result exceeds EAL or both EAL and Background if applicable.

-- No screening level available

TABLE 4-4

Data Results for Surface Soil (Blow in Place)

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample ID						**WVIA-B-001A**	**WVIA-B-001B**	**WVIA-B-002A**	**WVIA-B-002B**	**WVIA-B-003A**	**WVIA-B-003B**	**WVIA-B-004A**	**WVIA-B-004B**
AOC						AOC-03	AOC-03	AOC-03	AOC-03	AOC-02	AOC-02	AOC-03	AOC-03
Sample Type						N	N	N	N	N	N	N	N
Sample Depth (inches)						0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2
Sample Date						25-Mar-10	25-Mar-10	25-Mar-10	25-Mar-10	15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10
Chemical Group	**Analyte**	**Units**	**HDOH DE EAL DWT_<150 m SW**		**Background 95th Percentile**								
METAL	Aluminum	mg/kg	77,000	*	93,900	56,000	53,000	41,000	43,000	36,000	41,000	36,000	40,000
METAL	Antimony	mg/kg	6.3		6.9	4 J	0.83 UJ	1 UJ	0.83 UJ	**44 J**	**45 J**	**40 J**	**43 J**
METAL	Barium	mg/kg	3100		181	32	32	39	58	23	23	25	21
METAL	Chromium	mg/kg	500	**	483	340	370	270	250	230	240	230	250
METAL	Copper	mg/kg	630		183	120	120	110	430	220	300	120	380
METAL	Iron	mg/kg	55,000	*	177,000	130,000	120,000	110,000	100,000	99,000	110,000	95,000	110,000
METAL	Lead	mg/kg	400		27	47	64	19	130	13 J	14 J	15 J	58 J
METAL	Nickel	mg/kg	310		346	130 J	150 J	130 J	160 J	61	64	61	74
METAL	Zinc	mg/kg	4700		197	98 J	96 J	280 J	110 J	68	60	54	67
EXPL	1,3,5-trinitrobenzene	mg/kg	450		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	1,3-dinitrobenzene	mg/kg	1.2		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	2,4,6-trinitrotoluene	mg/kg	7.2		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**8.2**	0.21 U
EXPL	2,4-dinitrotoluene	mg/kg	24		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	2,6-dinitrotoluene	mg/kg	12		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	2-amino-4,6-dinitrotoluene	mg/kg	31		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	2-nitrotoluene	mg/kg	1.9		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	3-nitrotoluene	mg/kg	250		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	4-amino-2,6-dinitrotoluene	mg/kg	31		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	4-nitrotoluene	mg/kg	30		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	Hexahydro-1,3,5-trinitro-1,3,5-triazine	mg/kg	5.5		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	Nitrobenzene	mg/kg	6.2		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	n-methyl-n-2,4,6-tetranitroaniline	mg/kg	49		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
EXPL	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	mg/kg	770		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 U
CONV	Moisture content	pct	--		--	--	--	--	--	52	46	38	34

Notes:

AOC = Area of Concern
DU = Decision Unit
FD = field duplicate
HDOH = State of Hawaii Department of Health
mg/kg = milligrams per kilogram
METAL = includes methods SW6010B and SW7470A
CONV = conventional data; includes method D2216
EXPL = explosives; includes method SW8330

MS = matrix spike
MSD = matrix spike duplicate
N = normal sample
pct = percent
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
J = Analyte quantitation is estimated.
U = Analyte not detected

Sample WVIA-B-007A is the FD of WVIA-B-006A; sample WVIA-B-012B is the FD of WVIA-B-011B.
Sample WVIA-B-013B was collected post BIP operations at the same location as WVIA-B-005B.

*= Regional Screening Level (RSL), May 2010 EPA Residential (that is, no HDOH Tier 1 EAL available)

** = no DE EAL is available for chromium. The background level given by HDOH guidance is used
*** = the analytical method detection limit is higher than the site-specific EAL and the background concentrations.

HDOH DE EAL = State of Hawaii Department of HealthDirect Exposure Environmental Action Level (HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than 150 meters from surface water.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii (Earth Tech, 2006). Concentrations (95th percentile) in Koolau Volcanic Soil in accordance with Navy Policy on the Use of Background chemical levels.

Bold Detected result exceeds EAL or both EAL and Background if applicable.
-- No screening level available

TABLE 4-4
Data Results for Surface Soil (Blow in Place)
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample ID						WVIA-B-005A	WVIA-B-005B	WVIA-B-006A	WVIA-B-006B	WVIA-B-007A	WVIA-B-008A	WVIA-B-008B	WVIA-B-009A	WVIA-B-009B
AOC						AOC-03	AOC-03	AOC-04	AOC-04	AOC-04	AOC-04	AOC-04	AOC-04	AOC-04
Sample Type						N	N	N	N	FD	N	N	N	N
Sample Depth (inches)						0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2
Sample Date						15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10
Chemical Group	**Analyte**	**Units**	**HDOH DE EAL DWT_<150 m SW**		**Background 95th Percentile**									
METAL	Aluminum	mg/kg	77,000	*	93,900	51,000	57,000	33,000	34,000	34,000	35,000	41,000	39,000	35,000
METAL	Antimony	mg/kg	6.3		6.9	**51 J**	**52 J**	**41 J**	6.6 J	**46 J**	**43 J**	4.4 J	**37 J**	15*** UJ
METAL	Barium	mg/kg	3100		181	24	23	31	22	29	33	48	48	45
METAL	Chromium	mg/kg	500	**	483	330	340	240	270	250	240	240	220	260
METAL	Copper	mg/kg	630		183	180	**1,300**	90	110 J	90	96	240 J	120	56 J
METAL	Iron	mg/kg	55,000	*	177,000	130,000	120,000	100,000	110,000	110,000	100,000	100,000	89,000	94,000
METAL	Lead	mg/kg	400		27	32 J	300 J	7 J	18 J	7.2 J	8 J	30 J	5.7 J	8.1 J
METAL	Nickel	mg/kg	310		346	72	74	57	63	59	67	110	98	97
METAL	Zinc	mg/kg	4700		197	82	110	71	73 J	74	73	76 J	75	76 J
EXPL	1,3,5-trinitrobenzene	mg/kg	450		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	1,3-dinitrobenzene	mg/kg	1.2		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	2,4,6-trinitrotoluene	mg/kg	7.2		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	2,4-dinitrotoluene	mg/kg	24		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	2,6-dinitrotoluene	mg/kg	12		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	2-amino-4,6-dinitrotoluene	mg/kg	31		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	2-nitrotoluene	mg/kg	1.9		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	3-nitrotoluene	mg/kg	250		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	4-amino-2,6-dinitrotoluene	mg/kg	31		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	4-nitrotoluene	mg/kg	30		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	Hexahydro-1,3,5-trinitro-1,3,5-triazine	mg/kg	5.5		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	Nitrobenzene	mg/kg	6.2		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	n-methyl-n-2,4,6-tetranitroaniline	mg/kg	49		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
EXPL	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	mg/kg	770		--	0.21 U	0.2 U	0.2 U	0.2 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U
CONV	Moisture content	pct	--		--	49	42	45	39	43	42	34	37	37

Notes:

AOC = Area of Concern
DU = Decision Unit
FD = field duplicate
HDOH = State of Hawaii Department of Health
mg/kg = milligrams per kilogram
METAL = includes methods SW6010B and SW7470A
CONV = conventional data; includes method D2216
EXPL = explosives; includes method SW8330

MS = matrix spike
MSD = matrix spike duplicate
N = normal sample
pct = percent
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine

J = Analyte quantitation is estimated.
U = Analyte not detected

Sample WVIA-B-007A is the FD of WVIA-B-006A; sample WVIA-B-012B is the FD of WVIA-B-011B.
Sample WVIA-B-013B was collected post BIP operations at the same location as WVIA-B-005B.

*= Regional Screening Level (RSL), May 2010 EPA Residential (that is, no HDOH Tier 1 EAL available)

** = no DE EAL is available for chromium. The background level given by HDOH guidance is used
*** = the analytical method detection limit is higher than the site-specific EAL and the background concentrations.

HDOH DE EAL = State of Hawaii Department of HealthDirect Exposure Environmental Action Level
(HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than
150 meters from surface water.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii
(Earth Tech, 2006). Concentrations (95th percentile) in Koolau Volcanic Soil in accordance with Navy
Policy on the Use of Background chemical levels.

Bold Detected result exceeds EAL or both EAL and Background if applicable.
-- No screening level available

TABLE 4-4
Data Results for Surface Soil (Blow in Place)
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample ID						**WVIA-B-010A**	**WVIA-B-010B**	**WVIA-B-011A**	**WVIA-B-011B**	**WVIA-B-012B**	**WVIA-B-013B**
AOC						AOC-04	AOC-04	AOC-04	AOC-04	AOC-04	AOC-04
Sample Type						N	N	N	N	FD and MS/MSD	MS/MSD
Sample Depth (inches)						0-2	0-2	0-2	0-2	0-2	0-2
Sample Date						15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10	15-Apr-10
Chemical Group	**Analyte**	**Units**	**HDOH DE EAL DWT_<150 m SW**		**Background 95th Percentile**						
METAL	Aluminum	mg/kg	77,000	*	93,900	56,000	39,000	45,000	65,000	51,000	42,000
METAL	Antimony	mg/kg	6.3		6.9	**36 J**	**7.6 J**	**51 J**	12*** UJ	**56 J**	**8.8 J**
METAL	Barium	mg/kg	3100		181	63	72	58	40	23	21
METAL	Chromium	mg/kg	500	**	483	230	290	300	190	350	320
METAL	Copper	mg/kg	630		183	140	250 J	140	**850 J**	260	**970 J**
METAL	Iron	mg/kg	55,000	*	177,000	82,000	98,000	120,000	74,000	130,000	100,000
METAL	Lead	mg/kg	400		27	9.6 J	9.6 J	8.1 J	280 J	80 J	250 J
METAL	Nickel	mg/kg	310		346	140	120	140	130	73	68
METAL	Zinc	mg/kg	4700		197	120	83 J	97	170 J	84	110 J
EXPL	1,3,5-trinitrobenzene	mg/kg	450		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	1,3-dinitrobenzene	mg/kg	1.2		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	2,4,6-trinitrotoluene	mg/kg	7.2		--	0.2 U	0.2 U	0.2 U	0.2 U	0.37 J	0.2 J
EXPL	2,4-dinitrotoluene	mg/kg	24		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	2,6-dinitrotoluene	mg/kg	12		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	2-amino-4,6-dinitrotoluene	mg/kg	31		--	0.2 U	0.2 U	0.2 U	0.2 U	0.28	0.25
EXPL	2-nitrotoluene	mg/kg	1.9		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	3-nitrotoluene	mg/kg	250		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	4-amino-2,6-dinitrotoluene	mg/kg	31		--	0.2 U	0.2 U	0.2 U	0.2 U	0.3	0.25
EXPL	4-nitrotoluene	mg/kg	30		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	Hexahydro-1,3,5-trinitro-1,3,5-triazine	mg/kg	5.5		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	Nitrobenzene	mg/kg	6.2		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	n-methyl-n-2,4,6-tetranitroaniline	mg/kg	49		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EXPL	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	mg/kg	770		--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
CONV	Moisture content	pct	--		--	41	35	35	29	45	39

Notes:

AOC = Area of Concern
DU = Decision Unit
FD = field duplicate
HDOH = State of Hawaii Department of Health
mg/kg = milligrams per kilogram
METAL = includes methods SW6010B and SW7470A
CONV = conventional data; includes method D2216
EXPL = explosives; includes method SW8330

MS = matrix spike
MSD = matrix spike duplicate
N = normal sample
pct = percent
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
J = Analyte quantitation is estimated.
U = Analyte not detected

Sample WVIA-B-007A is the FD of WVIA-B-006A; sample WVIA-B-012B is the FD of WVIA-B-011B.
Sample WVIA-B-013B was collected post BIP operations at the same location as WVIA-B-005B.

*= Regional Screening Level (RSL), May 2010 EPA Residential (that is, no HDOH Tier 1 EAL available)

** = no DE EAL is available for chromium. The background level given by HDOH guidance is used
*** = the analytical method detection limit is higher than the site-specific EAL and the background concentrations.

HDOH DE EAL = State of Hawaii Department of HealthDirect Exposure Environmental Action Level (HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than 150 meters from surface water.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii (Earth Tech, 2006). Concentrations (95th percentile) in Koolau Volcanic Soil in accordance with Navy Policy on the Use of Background chemical levels.

Bold Detected result exceeds EAL or both EAL and Background if applicable.
-- No screening level available

TABLE 4-5

Summary of Detected Results for Subsurface Soil

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

											HDOH DE EAL			Background		
Location ID	Chemical Group	Analyte	Unit	Number of Detects	Number of Samples	Frequency of Detection	Minimum MDL	Maximum MDL	Minimum Detected Value	Maximum Detected Value	EAL	Number of Detects > EAL	Number of Nondetects > EAL	Background	Number of Detects > Value	Number of Nondetects > Value
AOC-01	METAL	copper	mg/kg	2	2	100%	--	--	22	30	630	--	--	183	--	--
	METAL	lead	mg/kg	2	2	100%	--	--	8.1	8.2	400	--	--	27	--	--
AOC-02	METAL	copper	mg/kg	6	6	100%	--	--	11	160	630	--	--	183	--	--
	METAL	lead	mg/kg	6	6	100%	--	--	2.2	8.9	400	--	--	27	--	--
AOC-03	METAL	copper	mg/kg	7	7	100%	--	--	22	73	630	--	--	183	--	--
	METAL	lead	mg/kg	7	7	100%	--	--	3.8	10	400	--	--	27	--	--
AOC-04	METAL	copper	mg/kg	8	8	100%	--	--	41	120	630	--	--	183	--	--
	METAL	lead	mg/kg	8	8	100%	--	--	3.6	8.1	400	--	--	27	--	--
Background	METAL	aluminum	mg/kg	2	2	100%	--	--	37,000	56,000	77,000 *	--	--	93,900	--	--
	METAL	arsenic	mg/kg	1	1	100%	--	--	2.7	2.7	0.43	1	--	15	--	--
	METAL	barium/barium 140	mg/kg	2	2	100%	--	--	25	74	3,100	--	--	181	--	--
	METAL	chromium	mg/kg	2	2	100%	--	--	270	400	500 **	--	--	483	--	--
	METAL	copper	mg/kg	2	2	100%	--	--	19	92	630	--	--	183	--	--
	METAL	Iron	mg/kg	2	2	100%	--	--	97,000	130,000	55,000 *	2	--	177,000	--	--
	METAL	lead	mg/kg	2	2	100%	--	--	4.3	30	400	--	--	27	1	--
	METAL	mercury	mg/kg	1	1	100%	--	--	0.29	0.29	4.7	--	--	0.77	--	--
	METAL	nickel	mg/kg	2	2	100%	--	--	69	92	310	--	--	346	--	--
	METAL	selenium	mg/kg	1	1	100%	--	--	10	10	78	--	--	10	--	--
	METAL	zinc	mg/kg	2	2	100%	--	--	67	210	4,700	--	--	197	1	--

Notes:

METAL = includes methods SW6010B and SW7470A.
mg/kg = milligrams per kilogram
MDL = method detection limit

Minimum/Maximum MDL evaluations only consider non detected results.

HDOH = State of Hawaii Department of Health

*= Regional Screening Level (RSL), May 2010 EPA Residential (that is, no HDOH Tier 1 EAL available)

** = no DE EAL is available for chromium. The background level given by HDOH guidance is used

HDOH DE EAL = State of Hawaii Department of Health Direct Exposure Environmental Action Level (HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than 150 meters from surface water.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, Hawaii (Earth Tech, 2006). Concentrations (95th percentile) in Koolau Volcanic Soil in accordance with Navy Policy on the Use of Background chemical levels.

-- = No value available

TABLE 4-6

Data Results for Subsurface Soil

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample ID				**WVIA-SS-001**	**WVIA-SS-002**	**WVIA-SS-003**	**WVIA-SS-004**	**WVIA-SS-005**	**WVIA-SS-006**	**WVIA-SS-007**	**WVIA-SS-008**	**WVIA-SS-009**	**WVIA-SS-010**	**WVIA-SS-011**	**WVIA-SS-012**	**WVIA-SS-013**
AOC				AOC1	AOC1	AOC2	AOC2	AOC2	AOC2	AOC2	AOC2	AOC3	AOC3	AOC3	AOC3	AOC3
Sample Type				N and MS/MSD	N	N	N	N	N	N	N	N	N	N	N	FD
Sample Depth (feet)				2	3	2	3	2	3	2	3	2	3	2	3	3
Sample Date				26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10	26-Apr-10
Analyte	**HDOH DE EAL DWT_<150 m SW**		**Background 95th Percentile**													
Aluminum	77,000	*	93,900	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	6.3		6.9	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	0.43		15	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	3,100		181	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	14		1.9	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	500		483	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	630		183	22 J	30 J	11 J	14 J	98 J	160 J	60 J	65 J	52 J	73 J	72 J	47 J	46 J
Iron	55,000	*	177,000	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	400		27	8.2	8.1	8.2	8.9	4.7	3.3	3	2.2	7.1	5.3	7.1	10	7.7
Mercury	4.7		0.77	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	310		346	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	78		10	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	78		2.8	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	4,700		197	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Sample WVIA-SS-013 is the FD of WVIA-SS-012; sample WVIA-SS-024 is the FD of WVIA-SS-023

METAL=includes methods SW6010B and SW7470A

*= Regional Screening Level (RSL), May 2010 EPA Residential (that is, no HDOH EAL available).

* *= Sample depth for WVIA-SS-026 is 0-0.5 inches.

AOC = Area of Concern
BK = background
HDOH = State of Hawaii Department of Health
MS/MSD = matrix spike/matrix spike duplicate
N = normal sample
FD = field duplicate
mg/kg = milligrams per kilogram
J = Analyte quantitation is estimated.
U = Analyte not detected

HDOH DE EAL = State of Hawaii Department of Health Direct Exposure Environmental Action Level (HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than 150 meters from surface water.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, HI (Earth Tech, 2006). Concentrations (95th percentile) in Koolau Volcanic Soil, in accordance with Navy Policy on the Use of Background chemical levels.

Bold Detected result exceeds EAL or both EAL and Background if applicable.

-- Parameter not analyzed at the specific location.

TABLE 4-6

Data Results for Subsurface Soil

Remedial Investigation, Waikane Valley Impact Area M

Sample ID			WVIA-SS-014	WVIA-SS-015	WVIA-SS-016	WVIA-SS-017	WVIA-SS-018	WVIA-SS-019	WVIA-SS-020	WVIA-SS-021	WVIA-SS-022	WVIA-SS-023	WVIA-SS-024	WVIA-SS-026
AOC			AOC3	AOC3	AOC4	AOC4	AOC4	Gate	AOC4	AOC4	AOC4	AOC4	AOC4	north of AOC4
Sample Type			N	N	N	N	N	BK	N	N	N	N	FD	BK
Sample Depth (feet)			2	3	2	3	2	2	2	3	2	3	3	0-0.5**
Sample Date			26-Apr-10	26-Apr-10	27-Apr-10	27-Apr-10	27-Apr-10	27-Apr-10	27-Apr-10	27-Apr-10	27-Apr-10	27-Apr-10	27-Apr-10	5-May-10
Analyte	**HDOH DE EAL DWT_<150 m SW**	**Background 95th Percentile**												
Aluminum	77,000 *	93,900	--	--	--	--	--	37,000	--	--	--	--	--	56,000
Antimony	6.3	6.9	--	--	--	--	--	0.69 UJ	--	--	--	--	--	0.81 UJ
Arsenic	0.43	15	--	--	--	--	--	**2.7**	--	--	--	--	--	--
Barium	3,100	181	--	--	--	--	--	25	--	--	--	--	--	74
Cadmium	14	1.9	--	--	--	--	--	0.35 U	--	--	--	--	--	--
Chromium	500	483	--	--	--	--	--	400 J	--	--	--	--	--	270
Copper	630	183	22 J	38 J	66 J	45 J	57 J	19 J	41 J	120	110	110	120	92
Iron	55,000 *	177,000	--	--	--	--	--	130,000	--	--	--	--	--	97,000
Lead	400	27	5	3.8	4.5	3.7	8	30	3.6	4.6	8	8	8.1	4.3
Mercury	4.7	0.77	--	--	--	--	--	0.29	--	--	--	--	--	--
Nickel	310	346	--	--	--	--	--	69	--	--	--	--	--	92
Selenium	78	10	--	--	--	--	--	10	--	--	--	--	--	--
Silver	78	2.8	--	--	--	--	--	0.35 U	--	--	--	--	--	--
Zinc	4,700	197	--	--	--	--	--	210	--	--	--	--	--	67

Notes:

Sample WVIA-SS-013 is the FD of WVIA-SS-012;
sample WVIA-SS-024 is the FD of WVIA-SS-023

METAL=includes methods SW6010B and SW7470A

*= Regional Screening Level (RSL), May 2010
EPA Residential (that is, no HDOH EAL available).

* *= Sample depth for WVIA-SS-026 is 0-0.5 inches.

AOC = Area of Concern
BK = background
HDOH = State of Hawaii Department of Health
MS/MSD = matrix spike/matrix spike duplicate
N = normal sample
FD = field duplicate
mg/kg = milligrams per kilogram
J = Analyte quantitation is estimated.
U = Analyte not detected

HDOH DE EAL = State of Hawaii Department of Health Direct Exposure Environmental Action Level (HDOH, Summer 2008 updated March 2009) for sites where drinking water is threatened and less than 150 meters from surface water.

Background = Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities, Oahu, HI (Earth Tech, 2006). Concentrations (95th percentile) in Koolau Volcanic Soil, in accordance with Navy Policy on the Use of Background chemical levels.

Bold — Detected result exceeds EAL or both EAL and Background if applicable.

-- — Parameter not analyzed at the specific location.

TABLE 4-7

Summary of Detected Results for Sediment

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

										NOAA SQuiRT		
Chemical Group	Analyte	Unit	Number of Detects	Number of Samples	Frequency of Detection	Minimum MDL	Maximum MDL	Minimum Detected Value	Maximum Detected Value	NOAA	Number of Detects > NOAA	Number of Nondetects > NOAA
CONV	Moisture content	pct	5	5	100%	--	--	28	34	--	--	--
METAL	Cobalt	mg/kg	5	5	100%	--	--	31	48	50	--	--
METAL	Copper	mg/kg	5	5	100%	--	--	95	110	16	5	--
METAL	Lead	mg/kg	5	5	100%	--	--	2.3	4	31	--	--

Notes:

METAL = includes methods SW6010B and SW7470A
CONV = conventional data; includes method D2216

Minimum/Maximum MDL evaluations only consider non detected results.

mg/kg = milligrams per kilogram
pct = percent
MDL = method detection limit

NOAA = National Oceangraphic and Atomospheric Association (NOAA) Screening Quick Reference Tables (SQuiRT).
(LEL) source = Guidelines for the protection and management of aquatic sediment quality in Ontario Aug 1993.

(shaded) Detected result exceeds NOAA SQuiRT.
-- No screning level available

TABLE 4-8

Data Results for Sediment

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample ID				**WVIA-S-001**	**WVIA-S-002**	**WVIA-S-003**	**WVIA-S-004**	**WVIA-S-005**
AOC				AOC5-downstream	AOC5-midstream	AOC5-upstream	AOC5-upstream	AOC5-upstream
Sample Type				N	N	N	FD	N
Sample Depth (inches)				0-6	0-6	0-6	0-6	0-6
Sample Date				13-Apr-10	13-Apr-10	13-Apr-10	13-Apr-10	13-Apr-10
Chemical Group	**Analyte**	**Units**	**NOAA SQuiRT Freshwater Sediment (LEL)**					
METAL	Cobalt	mg/kg	50	31 J	48 J	33 J	32 J	47 J
METAL	Copper	mg/kg	16	**95**	**110**	**98**	**98**	**100**
METAL	Lead	mg/kg	31	3.2	4	2.3	2.9	3.2
METAL	Mercury	mg/kg	0.2	0.03 U	0.028 U	0.03 U	0.03 U	0.032 U
EXPL	RDX	mg/kg	0.013*	0.2 U	0.2 U	0.2 U	0.19 U	0.2 U
CONV	Moisture content	pct	--	28	29	33	33	34

Notes:

METAL = includes methods SW6010B and SW7470A.
EXPL = explosives; includes method SW8330.
CONV = conventional data; includes method D2216.

AOC = Area of Concern
DU = Decision Unit
FD = field duplicate
HDOH = State of Hawaii Department of Health

mg/kg = milligrams per kilogram
N = normal sample
pct = percent
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine

J = Analyte quantitation is estimated.
U = Analyte not detected

Sample WVIA-S-004 is the FD of WVIA-S-003

* The laboratory reporting limit is higher than the EPA Region III BTAG freshwater sediment screening benchmark.

NOAA = National Oceangraphic and Atomospheric Association (NOAA) Screening Quick Reference Tables (SQuiRT).
(LEL) source = Guidelines for the protection and management of aquatic sediment quality in Ontario Aug 1993.
No screening level is available for hexahydro-1,3,5-trinitro-1,3,5-triazine; the screening level provided by the EPA Region III BTAG = 2004 EPA Region III Biological Technical Assistance Group was considered.

Bold Detected result exceeds NOAA SQuiRT.
-- No screening level available

TABLE 5-1

Environmental Hazard Evaluation - Surface Soil

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample Type	AOC-DU	Sample ID	Sample Depth	Depth Units	Sample Date	Chemical Group	Analyte	Result		Units	HDOH Gross Contamination EAL	HDOH Direct Exposure EAL
Multi-increment	AOC3-DU7	WVIA-M-029	0-6	IN	20-Apr-10	METAL	Copper	5,000	J	mg/kg	**1,000**	**630**
Blow in Place	AOC2	WVIA-B-003B	0-2	IN	15-Apr-10	METAL	Antimony	45	J	mg/kg	1,000	**6.3**
Blow in Place	AOC3	WVIA-B-004B	0-2	IN	15-Apr-10	METAL	Antimony	43	J	mg/kg	1,000	**6.3**
Blow in Place	AOC3	WVIA-B-005B	0-2	IN	15-Apr-10	METAL	Antimony	52	J	mg/kg	1,000	**6.3**
Blow in Place	AOC4	WVIA-B-010B	0-2	IN	15-Apr-10	METAL	Antimony	7.6	J	mg/kg	1,000	**6.3**
Blow in Place	AOC4	WVIA-B-012B	0-2	IN	15-Apr-10	METAL	Antimony	56	J	mg/kg	1,000	**6.3**

Notes:

AOC = Area of Concern
FT = feet
IN = inches
mg/kg = milligrams per kilogram

J = Analyte quantitation is estimated.

Bold = the specific EAL is exceeded

Samples collected at BIP locations before detonation are not considered in the EHE because only the post (B) BIP samples are theoretically representative of current conditions.

TABLE 6-1
MEC HA Input Factor Categories
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Explosive Hazard Component	Input Factor	Input Factor Category
Severity	Energetic Material Type	High Explosives and Low Explosive Fillers in Fragmenting Rounds
		White Phosphorous
		Pyrotechnic
		Propellant
		Spotting Charge
		Incendiary
	Location of Additional Human Receptors	Inside the MRS or inside the ESQD arc surrounding the MRS
		Outside the ESQD arc
Accessibility	Site Accessibility	Full Accessibility
		Moderate Accessibility
		Limited Accessibility
		Very Limited Accessibility
	Potential Contact Hours	Many Hours
		Some Hours
		Few Hours
		Very Few Hours
	Amount of MEC	Target Area
		Open Burning/Open Detonation (OB/OD) Area
		Function Test Range
		Burial Pit
		Maneuver Areas
		Firing Points
		Safety Buffer Areas

TABLE 6-1
MEC HA Input Factor Categories
Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Explosive Hazard Component	Input Factor	Input Factor Category
Accessibility	Amount of MEC	Storage
		Explosive-Related Industrial Facility
	Minimum MEC Depth Relative to the Maximum Receptor Intrusive Depth	Baseline Condition: MEC located surface and subsurface; After Cleanup: Intrusive depth overlaps with subsurface MEC.
		Baseline Condition: MEC located surface and subsurface; After Cleanup: Intrusive depth does not overlap with subsurface MEC.
		Baseline Condition: MEC located only subsurface; Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
		Baseline Condition: MEC located only subsurface; Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.
	Migration Potential	Possible
		Unlikely
Sensitivity	MEC Classification	Sensitive UXO
		UXO
		Fuzed Sensitive DMM
		Fuzed DMM
		Unfuzed DMM
		Bulk Explosives
	MEC Size	Small
		Large

TABLE 7-1

Samples Used in Risk Assessment

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample ID Number	Sample Date	Sample Type	Sample Depth	Depth Units	Area of Concern (AOC)	Decision Unit (DU)	Hypothetical Future Resident	Construction Worker	Recreational User (Soil)	Recreational User (Sediment)	Ecological Receptors
Surface Soil (Multi-Increment											
WVIA-M-001	4/19/2010	N	0-6	IN	AOC-01	DU-1	x	x	x		x
WVIA-M-002	4/19/2010	N	0-6	IN	AOC-01	DU-1	x	x	x		x
WVIA-M-003	4/19/2010	N	0-6	IN	AOC-01	DU-1	x	x	x		x
WVIA-M-004	4/19/2010	N	0-6	IN	AOC-02	DU-2	x	x	x		x
WVIA-M-005	4/19/2010	N	0-6	IN	AOC-02	DU-2	x	x	x		x
WVIA-M-006	4/19/2010	N	0-6	IN	AOC-02	DU-2	x	x	x		x
WVIA-M-007	4/19/2010	N	0-6	IN	AOC-02	DU-3	x	x	x		x
WVIA-M-008	4/19/2010	N	0-6	IN	AOC-02	DU-3	x	x	x		x
WVIA-M-009	4/19/2010	N	0-6	IN	AOC-02	DU-3	x	x	x		x
WVIA-M-010	4/19/2010	N	0-6	IN	AOC-02	DU-4	x	x	x		x
WVIA-M-011	4/19/2010	N	0-6	IN	AOC-02	DU-4	x	x	x		x
WVIA-M-012	4/19/2010	N	0-6	IN	AOC-02	DU-4	x	x	x		x
WVIA-M-013	4/20/2010	N	0-6	IN	AOC-04	DU-8	x	x	x		x
WVIA-M-014	4/20/2010	N	0-6	IN	AOC-04	DU-8	x	x	x		x
WVIA-M-015	4/20/2010	N	0-6	IN	AOC-04	DU-8	x	x	x		x
WVIA-M-016	4/20/2010	N	0-6	IN	AOC-04	DU-9	x	x	x		x
WVIA-M-017	4/20/2010	N	0-6	IN	AOC-04	DU-9	x	x	x		x
WVIA-M-018	4/20/2010	N	0-6	IN	AOC-04	DU-9	x	x	x		x
WVIA-M-019	4/20/2010	N	0-6	IN	AOC-04	DU-10	x	x	x		x
WVIA-M-020	4/20/2010	N	0-6	IN	AOC-04	DU-10	x	x	x		x
WVIA-M-021	4/20/2010	N	0-6	IN	AOC-04	DU-10	x	x	x		x
WVIA-M-022	4/20/2010	N	0-6	IN	AOC-03	DU-5	x	x	x		x
WVIA-M-023	4/20/2010	N	0-6	IN	AOC-03	DU-5	x	x	x		x
WVIA-M-024	4/20/2010	N	0-6	IN	AOC-03	DU-5	x	x	x		x
WVIA-M-025	4/20/2010	N	0-6	IN	AOC-03	DU-6	x	x	x		x
WVIA-M-026	4/20/2010	N	0-6	IN	AOC-03	DU-6	x	x	x		x
WVIA-M-027	4/20/2010	N	0-6	IN	AOC-03	DU-6	x	x	x		x
WVIA-M-028	4/20/2010	N	0-6	IN	AOC-03	DU-7	x	x	x		x
WVIA-M-029	4/20/2010	N	0-6	IN	AOC-03	DU-7	x	x	x		x
WVIA-M-030	4/20/2010	N	0-6	IN	AOC-03	DU-7	x	x	x		x
Subsurface Soil											
WVIA-SS-001	4/26/2010	N	2	FT	AOC-01	DU-1	x	x	x		x
WVIA-SS-002	4/26/2010	N	3	FT	AOC-01	DU-1	x	x	x		x
WVIA-SS-003	4/26/2010	N	2	FT	AOC-02	DU-4	x	x	x		x
WVIA-SS-004	4/26/2010	N	3	FT	AOC-02	DU-4	x	x	x		x
WVIA-SS-005	4/26/2010	N	2	FT	AOC-02	DU-3	x	x	x		x
WVIA-SS-006	4/26/2010	N	3	FT	AOC-02	DU-3	x	x	x		x
WVIA-SS-007	4/26/2010	N	2	FT	AOC-02	DU-2	x	x	x		x
WVIA-SS-008	4/26/2010	N	3	FT	AOC-02	DU-2	x	x	x		x
WVIA-SS-009	4/26/2010	N	2	FT	AOC-03	DU-5	x	x	x		x

TABLE 7-1

Samples Used in Risk Assessment

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Sample ID Number	Sample Date	Sample Type	Sample Depth	Depth Units	Area of Concern (AOC)	Decision Unit (DU)	Hypothetical Future Resident	Construction Worker	Recreational User (Soil)	Recreational User (Sediment)	Ecological Receptors
WVIA-SS-010	4/26/2010	N	3	FT	AOC-03	DU-5	x	x	x		x
WVIA-SS-011	4/26/2010	N	2	FT	AOC-03	DU-6	x	x	x		x
WVIA-SS-012	4/26/2010	N	3	FT	AOC-03	DU-6	x	x	x		x
WVIA-SS-013	4/26/2010	FD	3	FT	AOC-03	DU-6	x	x	x		x
WVIA-SS-014	4/26/2010	N	2	FT	AOC-03	DU-7	x	x	x		x
WVIA-SS-015	4/26/2010	N	3	FT	AOC-03	DU-7	x	x	x		x
WVIA-SS-016	4/27/2010	N	2	FT	AOC-04	DU-8	x	x	x		x
WVIA-SS-017	4/27/2010	N	3	FT	AOC-04	DU-8	x	x	x		x
WVIA-SS-018	4/27/2010	N	2	FT	AOC-04	DU-8	x	x	x		x
WVIA-SS-020	4/27/2010	N	2	FT	AOC-04	DU-9	x	x	x		x
WVIA-SS-021	4/27/2010	N	3	FT	AOC-04	DU-9	x	x	x		x
WVIA-SS-022	4/27/2010	N	2	FT	AOC-04	DU-10	x	x	x		x
WVIA-SS-023	4/27/2010	N	3	FT	AOC-04	DU-10	x	x	x		x
WVIA-SS-024	4/27/2010	FD	3	FT	AOC-04	DU-10	x	x	x		x
Blow in Place											
WVIA-B-001B	3/25/2010	N	0-2	IN	AOC-03	DU-6	x	x	x		x
WVIA-B-002B	3/25/2010	N	0-2	IN	AOC-03	DU-6	x	x	x		x
WVIA-B-003B	4/15/2010	N	0-2	IN	AOC-03	DU-4	x	x	x		x
WVIA-B-004B	4/15/2010	N	0-2	IN	AOC-03	DU-5	x	x	x		x
WVIA-B-005B	4/15/2010	N	0-2	IN	AOC-03	DU-7	x	x	x		x
WVIA-B-006B	4/15/2010	N	0-2	IN	AOC-04	DU-10	x	x	x		x
WVIA-B-008B	4/15/2010	N	0-2	IN	AOC-04	DU-10	x	x	x		x
WVIA-B-009B	4/15/2010	N	0-2	IN	AOC-04	DU-10	x	x	x		x
WVIA-B-010B	4/15/2010	N	0-2	IN	AOC-04	DU-10	x	x	x		x
WVIA-B-011B	4/15/2010	N	0-2	IN	AOC-04	DU-10	x	x	x		x
WVIA-B-013B	4/15/2010	N	0-2	IN	AOC-04	DU-10	x	x	x		x
WVIA-B-012B	4/15/2010	FD	0-2	IN	AOC-04	DU-10	x	x	x		x
Sediment											
WVIA-S-001	4/13/2010	N	0-6	IN	AOC-05	Waikane Stream				x	
WVIA-S-002	4/13/2010	N	0-6	IN	AOC-05	Waikane Stream				x	
WVIA-S-003	4/13/2010	N	0-6	IN	AOC-05	Waikane Stream				x	
WVIA-S-004	4/13/2010	FD	0-6	IN	AOC-05	Waikane Stream				x	
WVIA-S-005	4/13/2010	N	0-6	IN	AOC-05	Waikane Stream				x	

Notes:

FD = field duplicate sample
FT = feet
MS/MSD = matrix spike/matrix spike duplicate

IN = inches
N = normal sample

TABLE 7-2

Selection of Chemicals of Potential Concern (COPC) in Soil

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Constituent	Units	Decision Unit										Maximum Detect	95% UCL	Background Concentration	Maximum Detect Less than Background?	Selected as COPC[a]
		DU-1	DU-2	DU-3	DU-4	DU-5	DU-6	DU-7	DU-8	DU-9	DU-10					
2,4,6-Trinitrotoluene (TNT)	mg/Kg				0.2 U	0.21 U	0.2 U	0.2 U			0.37 J	0.37	0.239	NA	NA	Y
2-Amino-4,6-dinitrotoluene	mg/Kg				0.2 U	0.21 U	0.2 U	0.2 U			0.28	0.28	0.224	NA	NA	Y
4-Amino-2,6-dinitrotoluene	mg/Kg				0.2 U	0.21 U	0.2 U	0.2 U			0.3	0.3	0.228	NA	NA	Y
Aluminum	mg/Kg				41,000	40,000	53,000	57,000			65,000	65,000	48,964	93,900	Y	N
Antimony	mg/Kg				**45 J**	**43 J**	.83 U	**52 J**			**56 J**	**56**	**43**	6.9	N	Y
Barium	mg/Kg				23	21	58	23			72	72	44.5	181	Y	N
Chromium	mg/Kg				240	250	370	340			350	370	303.8	483	Y	N
Copper (MI)	mg/Kg	70	100	180	**320**	96	350	**5000 J**	89	150	130 J	**5,000**	**1,006**	183	N	Y
Iron	mg/Kg				110,000	110,000	100,000	120,000			130,000	130,000	112,040	177,000	Y	N
Lead (MI)	mg/Kg	10	11	**36**	**110**	**28**	**140**	**130**	7.2	**33**	10	**140**	**76.4**	27	N	Y
Nickel	mg/Kg				64	74	160 J	74			130	160	117	346	Y	N
Zinc	mg/Kg				60	67	110 J	110			170 J	170	106	197	Y	N

Notes:
MI = multi-incremental samples
J = The analyte was positively identified, the quantitation is an estimation.
U = Analyte not detected

Bold indicates above background
a. For the HHRA, COPCs were identified on a DU-specific basis, whereas for the ERA COPCs were identified on a site-wide basis.

TABLE 7-3

Selection of Chemicals of Potential Concern (COPC) in Sediment

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Constituent	Units	WVIA-S-001 AOC-05 April 13, 2010	WVIA-S-002 AOC-05 April 13, 2010	WVIA-S-003 AOC-05 April 13, 2010	WVIA-S-004 AOC-05 (FD) April 13, 2010	WVIA-S-005 AOC-05 April 13, 2010	Maximum Detect	Soil Background Concentration	Maximum Detect Less than Soil Background?	Selected as COPC
Hexahydro-1,3,5-trinitro-1,3,5-triazine	mg/Kg	0.2U	0.2U	0.2U	0.19U	0.2U	NA	181	NA	N
Cobalt	mg/Kg	31 J	48 J	33 J	32 J	47 J	48	--	Y	Y
Copper	mg/Kg	95	110	98	98	100	110	183	Y	Y
Lead	mg/Kg	3.2	4	2.3	2.9	3.2	4	27	Y	Y
Mercury	mg/Kg	0.03U	0.028U	0.03U	0.03U	0.032U	NA	0.77	NA	N

Notes:
mg/kg = milligram per kilogram
NA = not applicable
J = The analyte was positively identified, the quantitation is an estimation.
U = Analyte not detected

TABLE 7-4

Summary Statistics and 95% UCLs for Detected Constituents in Soil

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Soil Constituent	Units	Number of Samples	Detects	% Detects	Minimum	Maximum	Mean	95% UCL	UCL Basis
2,4,6-Trinitrotoluene (TNT)	mg/kg	13	2	15%	0.2	0.37	0.285	0.239	or 95% Modified-t UCL
2-Amino-4,6-dinitrotoluene	mg/kg	13	2	15%	0.25	0.28	0.265	0.224	or 95% Modified-t UCL
4-Amino-2,6-dinitrotoluene	mg/kg	13	2	15%	0.25	0.3	0.275	0.228	or 95% Modified-t UCL
Aluminum	mg/kg	13	13	100%	34,000	65,000	44,308	48,964	Use 95% Student's-t UCL
Antimony	mg/kg	13	9	69%	4.4	56	29.6	43.03	Use 95% Approximate Gamma UCL
Barium	mg/kg	13	13	100%	21	72	35.46	44.51	Use 95% Approximate Gamma UCL
Chromium	mg/kg	13	13	100%	190	370	277.7	303.8	Use 95% Student's-t UCL
Copper (MI)	mg/kg	30	30	100%	59	5000	295.7	1006	Use 95% Chebyshev (Mean, Sd) UCL
Iron	mg/kg	13	13	100%	74,000	130,000	105,077	112,040	Use 95% Student's-t UCL
Lead (MI)	mg/kg	30	30	100%	5.6	140	40.1	76.37	Use 95% Chebyshev (Mean, Sd) UCL
Nickel	mg/kg	13	13	100%	63	160	96.15	116.6	or 95% H-UCL
Zinc	mg/kg	13	13	100%	60	170	91.38	106.1	Use 95% Approximate Gamma UCL

Notes:

UCL = upper confidence limit on the mean

MI = multi-incremental sample

TABLE 7-5

Human Health Exposure Assumptions

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Parameter	Units	Hypothetical Future Resident	Source	Construction Worker	Source	Recreation User	Source
Constituent Concentration	mg/kg (dry wt.)	DU Maximum	Database	DU Maximum	Database	DU Maximum	Database
Body Weight - adult	kg	70	a	70	a	-	-
Body Weight - child	kg	15	a	-	-	36.3	b
Carcinogenic Averaging Time	days	25550	a	25550	a	25550	a
Noncarcinogenic Averaging Time	days	10950	a	2409.0	c	1825	d
Exposure Frequency	day/yr	350	a	20	e	52	d
Exposure Duration - adult	yrs	24	a	6.6	c	-	-
Exposure Duration - child	yrs	6	a	-	-	5	d
Incidental Soil Ingestion Rate - adult	mg/day	100	f	330	g	-	-
Incidental Soil Ingestion Rate - child	mg/day	200	a	-	-	200	a
Skin Surface Area - adult	cm^2/day	5,700	h	3,300	h	-	-
Skin Surface Area - child	cm^2/day	2,800	h	-	-	3,800	i
Dermal Absorption Factor	unitless	Chemical-specific	h	Chemical-specific	h	Chemical-specific	h
Soil-to-Skin Adherence Factor - adult	mg/cm^2	0.07	h	0.2	h	-	-
Soil-to-Skin Adherence Factor - child	mg/cm^3	0.2	h	-	-	0.2	h
Particulate Emission Factor	m^3/kg	1.30E+09	j	1.30E+09	j	1.30E+09	j
Volatilization Factor	m^3/kg	Chemical-specific	j	Chemical-specific	j	Chemical-specific	j

Source:

a. Risk Assessment Guidance for Superfund, Vol I: Human Health Evaluation Manual. Supplemental Guidance: Standard Default Exposure Factors. OSWER 9285.6-03. (EPA, 1991).

b. Average body weight of 10 yr-old male and female children. Exposure Factors Handbook Volume I General Factors. EPA/600/P-95/002Fa. (EPA, 1997).

c. Median work tenure for United States. Exposure Factors Handbook Volume I General Factors. EPA/600/P-95/002Fa. August 1997.

d. Based on professional judgement. Conservatively assumes recreational use 1 day per week year-round (52 days per year), over a 5-year duration.

e. Based on professional judgement. Conservatively assumes 4 work-weeks per year for soil excavation activities (20 days per year).

f. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Interim Guidance. (EPA. (2001a).

g. Represents an upper bound case for certain outdoor activities with high soil contact (e.g., construction or landscaping)(Kissel et al., 1998).

h. Risk Assessment Guidance for Superfund, Vol I: Human Health Evaluation Manual. Part E, Supplemental Guidance for Dermal Risk Assessment, Final. EPA/540/R/99/005.OSWER 9285.7-02EP (EPA, 2004). Soil-to-skin ratio adherence factor for construction workers is based on commercial/industrial landscaper.

i. Surface area based on 10-yr old with head, hands, forearms, and lower legs exposed; Exhibit C-1 of RAGS, Vol 1, Part E Supplemental Guidance for Dermal Risk Assessment. Final. (EPA, 2004).

j. Soil Screening Guidance: Users Gude. EPA/540/R-96/018. Office of Emergency and Remedial Response, Washington, D.C. PB96-963505.

DU = decision unit

TABLE 7-6

Summary of Toxicity Factors for Risk Estimates

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Analyte	Units	Class	Dermal Absorption Coefficient ABSd	Gastrointestinal Absorption Coefficient ABSgi	Oral Slope Factor Sfo (mg/Kg-day)	Source	Inhalation Unit Risk IUR $(ug/m^3)^{-1}$	Source	Oral Reference Dose RfDo (mg/Kg-day)	Source	Inhalation Reference Concentration (RfC) (mg/m^3)	Source
2,4,6-Trinitrotoluene	mg/kg	SVOC	3.2E-02	1.0E+00	3.0E-02	I	--	--	5.0E-04	I	--	--
2-Amino-4,6-dinitrotoluene	mg/kg	SVOC	6.0E-03	1.0E+00	--	--	--	--	2.0E-03	S	--	--
4-Amino-2,6-dinitrotoluene	mg/kg	SVOC	9.0E-03	1.0E+00	--	--	--	--	2.0E-03	S	--	--
Antimony	mg/kg	Metal	--	1.5E-01	--	--	--	--	4.0E-04	I	--	--
Cobalt	mg/kg	Metal	--	1.0E+00	--	--	9.00E-03	P	3.0E-04	P	6.0E-06	P
Copper	mg/kg	Metal	--	1.0E+00	--	--	--	--	4.0E-02	H	--	--
Lead	mg/kg	Metal	--	1.0E+00	--	--	--	--	--		--	--

Sources from Regional Screening Level Table (RSL) Master May 2010

C= Cal EPA

H= HEAST

I= IRIS

P= PPRTV

S= RSL User Guide, Section 5

TABLE 7-7

Risk Summary for Potential Receptors to Soil

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Decision Unit	Hypothetical Future Resident		Future Construction Worker		Future Recreational User		Primary Contributors [a]
	ELCR	HI	ELCR	HI	ELCR	HI	
DU-1	[b]	[b]	[b]	[b]	[b]	[b]	None
DU-2	[b]	[b]	[b]	[b]	[b]	[b]	None
DU-3	[b]	[b]	[b]	[b]	[b]	[b]	None
DU-4	[b]	0.4	[b]	0.03	[b]	0.09	None
DU-5	[b]	0.4	[b]	0.03	[b]	0.08	None
DU-6	[b]	0.03	[b]	0.002	[b]	0.007	None
DU-7	[b]	0.9	[b]	0.07	[b]	0.2	None
DU-8	[b]	[b]	[b]	[b]	[b]	[b]	None
DU-9	[b]	[b]	[b]	[b]	[b]	[b]	None
DU-10	2E-08	0.5	3E-10	0.04	1E-09	0.1	None

Notes:

a. Primary contributors to the total risk are listed when chemical-specific ELCR>10^{-6} or HQ>1.0.

b. No COPCs detected, or concentrations below background

ELCR = excess lifetime cancer risk

HI = hazard index

TABLE 7-8

Risk Summary for Potential Receptors to Sediment (0-6 inches bgs)

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Unit	ELCR	HI	Primary Contributors [a]
Sitewide	[b]	0.1	None

Notes:

a. Primary contributors to the total risk are listed when chemical-specific ELCR>10^{-6} or HQ>1.0.

b. No COPCs detected, or concentrations below background

ELCR = excess lifetime cancer risk

HI = hazard index

TABLE 7-9

Ecological Assessment Endpoints and Endpoint Species

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Assessment Endpoint Functional Group	Assessment Endpoint	Representative Endpoint Species	Measure of Exposure	Measure of Effect
Terrestrial Wildlife	Survival and health of terrestrial wildlife using the Waikane Valley Training Area, and potentially exposed to COPECs in surface soil and prey items	Represented by the Hawaiian Short-eared Owl or "pueo"	Measured COPEC levels in surface soil and modeled prey tissue	HDOH chronic no-observed adverse effect level (NOAEL) for birds, converted to a toxicity reference value for the Hawaiian short-eared owl (for site-specific evaluation)
Sediment Infauna	Survival and health of sediment infauna (e.g., freshwater benthic macroinvertebrates) using the Waikane Stream adjacent to the Waikane Valley Training Area, and potentially exposed to COPECs in sediment	Benthic macroinvertebrates	Measured COPEC levels in sediment	Sediment screening benchmarks protective of benthic infauna

TABLE 7-10

Wildlife Exposure Factors for Receptor of Concern

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Endpoint Species	Body Weight (kg)[a]	Food Intake (kg/day)[b]	Area Use Factor	Food Ingestion from Site (kg/day)	% of Diet as Small Mammal/Birds	% of Diet as Soil
Hawaiian short-eared owl ("pueo") *Asio flammeus sandwichensis*	0.348	0.136	0.5	0.068	100	2

Notes:

All units are in terms of dry weight

[a] Body weight for the Short-eared owl (*Asio flammeus*) (INHS,2010)

[b] Food intake rate calculated using the following equation for non-passerines from the EPA Wildlife Exposure Factors Handbook (EPA, 1993):

FI (kg/day) = [0.301*BW0.751(g)]/1000

TABLE 7-11

Intake Estimation and Hazard Quotient for the Hawaiian Short-eared Owl ("pueo")

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Soil Constituent	Body Weight (kg)	Daily Food Intake (kg/day)	Area Use Factor	Daily Food Ingestion from Site (kg/day)	Fraction of Diet as Small Mammal/Bird	Soil-to-Mammal/Bird BAF	Fraction of Diet as Soil	Soil Concentration (mg/kg)	Chemical Intake (mg/kg-d)	NOAEL-based Toxicity Reference Value (mg/kg-d)	Short-eared Owl Hazard Quotient
Antimony	0.348	0.136	0.5	0.068	1	1.0	0.02	4.30E+01	3.09E+00	--	**--**
Copper (MI)	0.348	0.136	0.5	0.068	1	0.021	0.02	1.01E+03	5.35E+00	4.05E+00	**1.3**
Lead (MI)	0.348	0.136	0.5	0.068	1	0.096	0.02	7.64E+01	7.98E-01	1.63E+00	0.5
2,4,6-Trinitrotoluene (TNT)	0.348	0.136	0.5	0.068	1	0.008	0.02	2.39E-01	1.06E-03	7.00E-01	0.002
2-Amino-4,6-dinitrotoluene	0.348	0.136	0.5	0.068	1	0.012	0.02	2.24E-01	1.06E-03	1.00E-01	0.011
4-Amino-2,6-dinitrotoluene	0.348	0.136	0.5	0.068	1	0.012	0.02	2.28E-01	1.07E-03	1.00E-01	0.011

Hazard Index for COPECs with Similar Toxicological Mechanisms

Receptor	Muntions-Related Compounds
Pueo	0.02

Notes:

a) Soil to small mammal regression (Sample et al., 1998); 90% UCL soil to small mammal BAF (Sample, 1998) - See Table 7

b) For COPECs without available regression equations for calculation of site-specific BAFs, See Table 7

c) An area use factor of 0.5 was conservatively assumed with consideration of available habitat and since pueo are known to relocate to areas of higher prey populations.

TABLE 7-12

Site-Specific Biotransfer Factors Using Log-Linear Regression Models and Other Available Resources

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Soil Constituent	Receptor	Soil EPC (mg/kg)	B0	B1	Prey Conc. (dry weight)[d]	Small Mammal BAF[e]	Source	Log Kow	Source
Antimony	--	43.03	--	--	--	1	b	--	--
Copper (MI)	Small Mammal	1,006	2.042	0.1444	20.9	0.021	a	--	--
Lead (MI)	Small Mammal	76	0.0761	0.4422	7.3	0.096	a	--	--
2,4,6-Trinitrotoluene (TNT)	--	0.239	--	--	--	0.0079	c; RTI 2005	1.6	EPI Suite 2009
2-Amino-4,6-dinitrotoluene	--	0.224	--	--	--	0.0118	c; RTI 2005	1.84	EPI Suite 2009
4-Amino-2,6-dinitrotoluene	--	0.228	--	--	--	0.0118	c; RTI 2005	1.84	EPI Suite 2009

Notes:

a) Source: Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter II. 1998. Development and Validation of *Bioaccumulation Models for Small Mammals* . Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-219.

b) For COPECs without available BAFs, a value of 1 was assumed

c) Consistent with EPA 2007, Talmage et al. 1999, and considering their low log K_{ow}; munitions related compounds are readily metabolized and not expected to bioaccumulate.

d) ln(Prey Conc.[dry weight]) = B0 + B1(ln[soil conc])

e) Dry weight BAF for metals = prey concentration divided by soil EPC; for explosives: BAF = $10^{((-0.099*\log Kow^2)+(1.07*(\log Kow)-3.56))}$

EPC = exposure point concentration

BAF = bioaccumulation factor

TABLE 7-13

Comparison of Detect Sediment Constituents with Sediment Screening Benchmarks

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

									Sediment Screening Benchmaks[b]	
Constituent	Units	WVIA-S-001 AOC-05 April 13, 2010	WVIA-S-002 AOC-05 April 13, 2010	WVIA-S-003 AOC-05 April 13, 2010	WVIA-S-004 (FD) AOC-05 April 13, 2010	WVIA-S-005 AOC-05 April 13, 2010	Soil Background Concentration[a]	Maximum Detect Less than Background?	TEC	PEC
Cobalt	mg/kg	31 J	48 J	33 J	32 J	47 J	--	--	--	>50[c]
Copper	mg/kg	95	110	98	98	100	183	Y	31.6	149
Lead	mg/kg	3.2	4	2.3	2.9	3.2	27	Y	35.8	128

Notes:

a) *Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities* , Pacific Division, Naval Facilities Engineering Command (Earth Tech, 2006).

b) Source: NOAA SQuiRT (Buchman, 2009); Original Source: MacDonald et al. (2000).

c) For cobalt, only a lowest-effect level (LEL) was available. The LEL is a level of sediment contamination that can be tolerated by the majority of benthic organisms.

TEC = threshold effects concentration

PEC = probable effects concentration

J = The analyte was positively identified, the quantitation is an estimation.

TABLE 7-14

Calculation of Pueo NOAEL-Based Toxicity Reference Values (TRVs)

Remedial Investigation, Waikane Valley Impact Area Munitions Response Site, Kaneohe, Oahu, Hawaii

Soil Constituent	Chemical Form Tested or Surrogate Used	Source	Test Species	Toxicity Endpoint	Dose (mg/kg-bw-day)	Toxicity Endpoint UFs[a]	TRV (mg/kg-bw-day)
Antimony	NA	NA	NA	NA	NA	NA	--
Copper (MI)	---	EPA Eco SSL (2007)	c	c	4.05	1	4.05
Lead (MI)	---	EPA Eco SSL (2005)	c	c	1.63	1	1.63
2,4,6-Trinitrotoluene (TNT)	2,4,6-Trinitrotoluene	b	Northern Bobwhite (quail)	Subchronic NOAEL	7.0	10	0.70
2-Amino-4,6-dinitrotoluene	2,4-dinitrotoluene	b	Northern Bobwhite (quail)	Subchronic NOAEL	1.0	10	0.10
4-Amino-2,6-dinitrotoluene	2,4-dinitrotoluene	b	Northern Bobwhite (quail)	Subchronic NOAEL	1.0	10	0.10

Notes:

a) Toxicity uncertainty factors used for extrapolating to chronic NOAELs are as provided by Wentsel et al., 1996

b) Wildlife Toxicity Reference Values (TRVs) for Ecological Risk Assessments: http://chppm-www.apgea.army.mil/erawg/tox/index.htm

c) EPA Ecological Soil Screening Levels conservatively compare the geometric mean of NOAELs for mortality, growth, and reproduction with the lowest LOAEL for multiple species. The geometric mean of the NOAELs is used if it is below the lowest LOAEL. If it exceeds the LOAEL, then the highest bounded NOAEL below the lowest LOAEL is used.

UF = uncertainty factor

NA = not available

NOAEL = no observed adverse effect level

LOAEL = lowest observed adverse effect level

APPENDIX A

Checklists

Checklists

Explosive Demolition

USA Environmental

EXPLOSIVE DISPOSAL LOG

Project Information

Project Name:	Waikane Valley Impact Area	Start Time:	1300
Project Location:	Waikane Valley, Hawaii	Stop Time:	1420

MEC Disposed of This Date (List items and quantity of each item)

Rocket, HEAT, 3.5”, Practice (1 Each)

Donor Explosive Used (List types and quantity)

Cap, blasting, electric (1 each)
Cord, detonating, 80 grain (10 Feet)
Perforator, Jet, 32 gram (1 Each)

Remarks

Demonstration for RAB members

Approval

Demolition Supervisor: [signature] Date: 3-18-2010

Attachment 5

USA Environmental

EXPLOSIVE DISPOSAL LOG

Project Information

Project Name:	Waikane Valley Impact Area	Start Time:	1045
Project Location:	Waikane Valley, Hawaii	Stop Time:	1530

MEC Disposed of This Date (List items and quantity of each item)

Rocket, HEAT, 2.36", Live (2 Each)

Donor Explosive Used (List types and quantity)

Cap, blasting, electric (2 each)
Cord, detonating, 80 grain (20 Feet)
Perforator, Jet, 32 gram (2 Each)

Remarks

Two (2) independent disposal operations, both successful

Approval

Demolition Supervisor: [signature]

Date: 3-25-2010

Attachment 5

USA Environmental

EXPLOSIVE DISPOSAL LOG

Project Information

Project Name:	Waikane Valley Impact Area Remedial Investigation/Feasibility Study (RI/FS)	Start Time:	1045
Project Location:	Waikane Valley, Kaneohe, Oahu, Hawaii	Stop Time:	1530

MEC Disposed of This Date (List items and quantity of each item)

Warhead, Rocket, HEAT, 2.36", Live (4 ea. on Consolidation Shot)
Warhead, Rocket, HEAT, 3.5", Live (1 ea. on Consolidation Shot)
2.36" HEAT rocket fuzes with detonator attached to Rocket Motor (2 ea. on Consolidation Shot)
Grenade, Rifle, M29 Practice (1 ea. on Consolidation Shot)
Rocket, AT, 3.5" Practice (84 ea. on Consolidation Shot)
Rocket, AT, 3.5" Practice (6 ea. separate BIP)
Rocket Warhead, AT, 3.5" Practice (2 ea. disposed of at one of the BIP locations)

Donor Explosive Used (List types and quantity)

Cap, blasting, electric (6 each)
Cord, detonating, 80 grain (430 Feet)
Perforator, Jet, 32 gram (66 Each)

Remarks

Three (3) separate explosive demolition disposal shots were conducted, all successful. First demolition shot 3 BIP locations, second demolition shot 3 BIP locations, and the third demolition shot was single consolidation shot.

Approval

Demolition Supervisor: ______________________ Date: 3-30-2010

Attachment 5

EXPLOSIVE DISPOSAL LOG

Project Information

Project Name:	Waikane Valley Impact Area Remedial Investigation/Feasibility Study (RI/FS)	Start Time:	1330
Project Location:	Waikane Valley, Kaneohe, Oahu, Hawaii	Stop Time:	1545

MEC Disposed of This Date (List items and quantity of each item)

Rocket, HEAT, 2.36", confirmed HE (1 ea. disposed of at northern BIP/disposal location)
Rocket, HEAT, 2.36", confirmed Practice/Inert (1 ea. Disposed of at southern BIP/disposal location)
Grenade, Rifle, M9, confirmed Practice/Inert (vented/disposed of at southern BIP/Disposal location)

Donor Explosive Used (List types and quantity)

Cap, blasting, electric (4 each)
Cord, detonating, 80 grain (20 Feet)
Perforator, Jet, 32 gram (3 Each)

Remarks

Two (2) separate explosive demolition disposal shots were conducted, both successful. First demolition shot was a single UXO item at 1 BIP location, second demolition shot were two items at one location, 1- suspected UXO item and 1- suspected MPPEH item at a BIP/Consolidation location.

Approval

Demolition Supervisor: Daniel W[illegible]

Date: 4-01-2010

Attachment 5

EXPLOSIVE DISPOSAL LOG

Project Information

Project Name:	Waikane Valley Impact Area Remedial Investigation/Feasibility Study (RI/FS)	Start Time:	0730
Project Location:	Waikane Valley, Kaneohe, Oahu, Hawaii	Stop Time:	1600

MEC Disposed of This Date (List items and quantity of each item)

Grenade, Rifle, HEAT, 7 ea. (6 confirmed M28 HE,1 confirmed M29 Practice) disposed of at AOC4 southeast BIP/disposal location)

Grenade, Rifle, HEAT, M28 1 ea. (confirmed HE) disposed of at AOC4 southwest BIP/disposal location)

Rocket, 3.5", HEAT,1 ea. (confirmed HE) disposed of at AOC3 northern BIP/disposal location)

Mortar, 60MM, 1 ea. (confirmed HE) disposed of at AOC3 northern BIP/disposal location)

Grenade, Rifle, HEAT, M28,1 ea. (confirmed HE) disposed of at AOC3 southern BIP/disposal location)

Grenade, Hand, M30,1 ea. (confirmed MPPEH) disposed of at AOC3 southern BIP/disposal location)

Block, Demolition, TNT, ¼-pound, M030 (1 ea. disposed of at AOC3 southern BIP/disposal location)

Grenade, Rifle, HEAT, M28, 1 ea. (confirmed HE) disposed of at AOC2 BIP/disposal location

Donor Explosive Used (List types and quantity)

Cap, blasting, electric, no delay (10 each)

Cord, detonating, 80 grain (150 Feet)

Perforator, RDX shape charge, 19.5 gram (13 Each)

Remarks

Five (5) separate explosive demolition disposal shots were conducted, all were successful. Shot #1 (6 M28 HEAT Rifle Grenades and 1 M29 Practice Rifle Grenade) and shot #2 (one M28 HEAT Rifle Grenade) were in AOC4 and all except 1 were live. Shot # 3 (consolidated BIP with a 3.5-inch HEAT rocket and a 60MM mortar) and shot #4 (consolidated M28 HEAT Rifle Grenade, M30 Hand Grenade, and M030 ¼-pound TNT demolition block) were in AOC3. All these items were also live. Shot #5 was a single M28 HEAT Rifle Grenade in AOC2. This item was also live. Modified sandbag mitigation procedures were used on shots #3, #4, and #5.

Approval

Demolition Supervisor:	Date: 4-15-2010

Attachment 5

EXPLOSIVE DISPOSAL LOG

Project Information

Project Name:	Waikane Valley Impact Area Remedial Investigation/Feasibility Study (RI/FS)	Start Time:	1100
Project Location:	Waikane Valley, Kaneohe, Oahu, Hawaii	Stop Time:	1320

MEC Disposed of This Date (List items and quantity of each item)

Grenade, Rifle, HEAT,M28 (confirmed HE, disposed of in Grid 4-6)

Rocket, 3.5-inch (located outside surface swept are above AOC2, confirmed HE)

Motor, rocket, 2.36-inch with fuze and detonator (located in AOC3 and moved to 3.5”-rocket motor location, confirmed live)

Rocket, HEAT, 2.36-inch (located outside surface swept area east of AOC2, confirmed HE)

Motor, 60MM (portion remaining from demolition shot on 4-15-2010, white residue confirmed as plaster)

Fragmentation, 75MM Projectile (3 ea.) (located during surface sweep of AOC3, unable to dig out dirt, blasted using knotted detonating cord, confirmed MD)

Donor Explosive Used (List types and quantity)

Cap, blasting, electric, no delay (6 each)

Cord, detonating, 80 grain (95 Feet)

Perforator, RDX shape charge, 19.5 gram (5 Each)

Remarks

Three (3) separate explosive demolition disposal shots were conducted, all were successful. Shot #1 (1 M28 Rifle Grenade in Grid AOC4-6. Shot #2 (consolidated BIP, one 3.5-inch HEAT Rocket and 1 ea. 2.36-inch Rocket Motor with fuze and detonator). Shot # 3 (consolidated BIP with a 2.36-inch HEAT rocket, a piece of a 60MM mortar, and 3 ea. fragments of 75MM Projectiles).

Approval

Demolition Supervisor: [signature]	Date: 4-29-2010

Attachment 5

APPENDIX A

Field Daily Reports

Field Daily Reports

March 2010

DAILY OPERATIONS SUMMARY

DATE: Monday, 3/15/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC 1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	0

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Conduct an overall project description brief, site operations brief, Work Plan Review, Health and Safety Plan Review, Accident Prevention Plan Review, Activity Hazard Analysis Review, Natural Resources brief and Cultural Awareness brief with all project field personnel..

3. **MEC SUMMARY**

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended: No demolition items expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition: No MD/Scrap generated or disposed of.

Type:	Quantity:	Weight:	Remarks:

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	10	10	0	0
UXO Technician III	115 / 5.3	20	20	0	0
UXO Technician II	115 / 5.3	30	30	0	0
UXO Technician II	115 / 5.2	10	10	0	0
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	40	0	0
UXOQCS	115 / 5.2	10	10	0	0
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	10	0	0
DEI / UXO Tech II	115 / 5.3	10	10	0	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115	0	0	0	0
Pacific Helicopter	115	0	0	0	0

b. Daily Equipment:

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-113	4	10	
Truck, Crew Cab 4WD	6210-113	1	10	
Truck, Pick-up 4WD	6210-113	1	10	Explosive Transport
Schonstedt	6210-113	13	0	
White's Detector	6210-113	5	0	
Trimble GeoXH GPS	6210-113	1	10	
Remote Firing Device	6210-113	1	10	
Brush Cutter	6210-113	2	0	
Chain Saw	6210-113	2	0	
Self Storage Rental Unit	6210-113	1	10	
Cell Phone	6210-113	1	12	
Office Desk/Chair	6210-113	1	10	
Digital Camera	6210-113	4	0	
Hand Held Radio	6210-113	8	10	
EMT Medical Gear	6210-113	1	10	
Team Safety Equipment	6210-113	2	0	
Team Operating Equipment	6210-113	2	0	
Laptop Computer	6210-113	1	12	
Printer	6210-113	1	10	

5. Operational Remarks:

Field personnel assigned to the Waikane RI Project is 1-Site Manager; 1-Senior UXO Supervisor (SUXOS); 1-UXO Safety Officer; 1-Quality Control Supervisor; 2-UXO Technicians III (Team Leaders); 5-UXO Technicians II (1-UXO Technician II from Donaldson Enterprise Inc.); 4-UXO Technicians I; 2-Archeologist from Pacific Consulting Services; and 3-Soil Sample Technicians from Wil Chee Planning.

A Project overview and Work Plan review was conducted this morning and early part of the afternoon in support of the Remedial Investigation (RI) Project for the MCBH Waikane Valley Impact Area. The project overview and review of the work plan was conducted with all field personnel to include the Archeologist from PCSI whom will be with each team during all field operations. The Site Manager and SUXOS conducted an overall project description and operations brief for the RI operations to be conducted. A review of the Work Plan, Health and Safety Plan, Accident Prevention Plan, and Activity Hazard Analysis were conducted by the project UXO Safety Officer with all project field personnel.

The project field team proceeded to the Self-Storage Rental Unit located in Kaneohe where all field equipment was inventoried, set-up and made ready for field operations.

6. Signature / Date:

__________Daniel Miller_____________ **Date:** 3/15/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 3/16/2010

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC 1	0	0
(b) AOC2	0	0
(c) AOC3	6%	6%
(d) AOC4	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	0

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Commence remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan and MEC Sampling Analysis Plan. Commence conducting surface sweep operations in the southern section of Area of Concern (AOC) 3 near the Waikane Spring area in preparation of the RAB Site Visit and MEC explosive disposal demonstration scheduled for Thursday the 18th of March.

3. MEC SUMMARY

a. MEC (UXO)/MPPEH Located: No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:
Rocket, AT, 3.5”, fired, motor expended, intact warhead, unknown filler, practice fuze.	24 each	MPPEH Unknown Filler	All items consolidated within AOC 3 until venting and/or demilitarization can be conducted at a later date.

b. Demolition Supplies Expended: No demolition items expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep within AOC 3.	Various	130 Lbs.	All MD recovered during the days operations were inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	11	3	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115	0	0	0	0
Pacific Helicopter	115	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-113	4	10	
Truck, Crew Cab 4WD	6210-113	1	10	
Truck, Pick-up 4WD	6210-113	1	10	Explosive Transport
Schonstedt	6210-113	13	10	
White's Detector	6210-113	5	0	
Trimble GeoXH GPS	6210-113	3	10	
Remote Firing Device	6210-113	1	10	
Brush Cutter	6210-113	2	10	
Chain Saw	6210-113	2	10	
Self Storage Rental Unit	6210-113	1	10	
Cell Phone	6210-113	1	12	
Office Desk/Chair	6210-113	1	10	
Digital Camera	6210-113	4	10	
Hand Held Radio	6210-113	8	10	
EMT Medical Gear	6210-113	1	10	
Team Safety Equipment	6210-113	2	10	
Team Operating Equipment	6210-113	2	10	
Laptop Computer	6210-113	1	12	
Printer	6210-113	1	10	

5. Operational Remarks:

All personnel assembled behind the Ilikai Condominium complex and departed for the designated Daily Safety brief site in Kanehoe and met the archeologists and UXOSO. Upon arriving at the site, the UXOSO conducted the Safety Brief, followed by briefs by the SUXOS, Site Manager, and the Medic.

After completion of these briefs, all personnel departed for the Self-Storage rental unit, retrieved the required equipment for the days' operations, and continued on to the staging area in the Waikane Valley Impact Area.

All Schonstedts were tested in the Instrument Test Strip (ITS) under the observation of the UXOQC and SUXOS. All instruments tested satisfactorily, and the 2 UXO teams, archeologists, and UXOQC assistant departed for Area of Concern Three (AOC3), with the UXOQC assistant leading using the GPS.

The major objective for today's operation was to locate the Waikane Spring, and commence surface clearance in the adjacent area in preparation for the RAB member's tour on Thursday. Due to the extremely thick jungle canopy, the GPS was not able to lock onto satellites. The spring was finally located using the contour maps.

Surface sweep operations were started and approximately 6% of AOC3 was completed.

All personnel returned to the staging area, loaded the vehicles, and departed for the Self-Storage rental unit to store equipment, then departed for the rental condominium units in Waikiki.

6. Signature / Date:

__________Daniel Miller_______________ **Date:** 3/16/2010

Site Manager

DAILY OPERATIONS SUMMARY

DATE: Wednesday, 3/17/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:

Work Accomplished	Completed	Cumulative
(1) Surface Sweep		
(a) AOC 1	0	0
(b) AOC2	0	0
(c) AOC3	12%	18%
(d) AOC4	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	0

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan and MEC Sampling Analysis Plan. Continue surface sweep operations in the southern section of Area of Concern (AOC) 3 near the Waikane Spring area in preparation of the RAB Site Visit and MEC explosive disposal demonstration scheduled for Thursday the 18th of March.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located:

Type:	Quantity:	Live/Prac.	Remarks:
Rocket, AT, 3.5”, fired, motor expended, intact warhead, unknown filler, practice fuze.	37 each	MPPEH Unknown Filler	All items consolidated within AOC 3 until venting and/or demilitarization can be conducted at a later date.

b. Demolition Supplies Expended: No demolition items expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep within AOC 3.	Various	140 Lbs.	All MD recovered during the days operations were inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	12	4	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	4.5	2	0	2.5
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115	0	0	0	0
Pacific Helicopter	115	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-113	4	10	
Truck, Crew Cab 4WD	6210-113	1	10	
Truck, Pick-up 4WD	6210-113	1	10	Explosive Transport
Schonstedt	6210-113	13	10	
White's Detector	6210-113	5	0	
Trimble GeoXH GPS	6210-113	3	10	
Remote Firing Device	6210-113	1	10	
Brush Cutter	6210-113	2	10	
Chain Saw	6210-113	2	10	
Self Storage Rental Unit	6210-113	1	10	
Cell Phone	6210-113	1	12	
Office Desk/Chair	6210-113	1	10	
Digital Camera	6210-113	4	10	
Hand Held Radio	6210-113	8	10	
EMT Medical Gear	6210-113	1	10	
Team Safety Equipment	6210-113	2	10	
Team Operating Equipment	6210-113	2	10	
Laptop Computer	6210-113	1	12	
Printer	6210-113	1	10	

5. Operational Remarks:

All personnel assembled behind the Ilikai Condominium complex and departed for the designated Daily Safety brief site in Kanehoe and met the archeologists and UXOSO. Upon arriving at the site, the UXOSO conducted the Safety Brief. The Site Manager then conducted training on the GPS with both Team Leaders

After completion of these briefs, all personnel departed for the Self-Storage rental unit, retrieved the required equipment for the days' operations, and continued on to the staging area in the Waikane Valley Impact Area.

All Schonstedts were tested in the Instrument Test Strip (ITS) under the observation of the UXOQC and SUXOS. All instruments tested satisfactorily, and the 2 UXO teams, archeologists, UXOQC, UXOQC Assistant, and the UXOSO departed for AOC3, with the UXOQC Assistant again leading using the GPS.

The continuing major objective was to surface clear the area around the Waikane Spring. The extremely thick jungle canopy again would not allow the GPS to lock onto satellites. The path to the Spring had been marked the previous day using engineering tape and the teams were able to return to the previous days' work area easily. Surface sweep operations were conducted and approximately an additional 12% of AOC3 was completed.

All personnel returned to the staging area, loaded the vehicles, and departed for the Self-Storage rental unit to store equipment, then departed for the rental condominium units in Waikiki.

6. Signature / Date:

__________ Daniel Miller______________ **Date:** 3/17/2010

Site Manager

DAILY OPERATIONS SUMMARY

DATE: Thursday, 3/18/2010 **PAGE 1 OF 6 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC 1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0%**	**18%**
(d) AOC4	**0**	**0**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**0**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**0**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Prepare for the day's scheduled RAB Site Visit and conduct the MEC explosive disposal demonstration for the RAB members scheduled for the day's site operations.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located: No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:
Cap, blasting, electric	2 Each	
Cord, detonating, 80 grain	10 Feet	
Perforator, 32 gram	1 Each	

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
3.5 inch Practice Rocket, motor fired and expended.	1 each	15 Lbs.	Item vented during the day's explosive demolition operations, and then inspected for energetic material, and consolidated within the AOC for disposal at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	11	11	0	0
SUXOS	115 / 5.2	11	3	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	10	5	0	5
Wil Chee Planning	115 / 5.5	16.5	16.5	0	0
CH2M Hill	115 / 5.3	5.5	5.5	0	0
Pacific Helicopter	115	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-113	4	10	
Truck, Crew Cab 4WD	6210-113	1	10	
Truck, Pick-up 4WD	6210-113	1	10	Explosive Transport
Schonstedt	6210-113	13	10	
White's Detector	6210-113	5	10	
Trimble GeoXH GPS	6210-113	3	10	
Remote Firing Device	6210-113	1	10	
Brush Cutter	6210-113	2	10	
Chain Saw	6210-113	2	10	
Self Storage Rental Unit	6210-113	1	10	
Cell Phone	6210-113	1	12	
Office Desk/Chair	6210-113	1	10	
Digital Camera	6210-113	4	10	
Hand Held Radio	6210-113	8	10	
EMT Medical Gear	6210-113	1	10	
Team Safety Equipment	6210-113	2	10	
Team Operating Equipment	6210-113	2	10	
Laptop Computer	6210-113	1	12	
Printer	6210-113	1	10	

5. Operational Remarks:

All personnel assembled behind the Ilikai Condominium complex and departed for the designated Daily Safety brief site in Kanehoe and met the archeologists and UXOSO. Upon arriving at the site, the UXOSO conducted the Safety Brief. The Site Manager then conducted training on the GPS with both Team Leaders

After completion of these briefs, all personnel departed for the Self-Storage rental unit, retrieved the required equipment for the days' operations, and continued on to the staging area in the Waikane Valley Impact Area.

All Schonstedts were tested in the Instrument Test Strip (ITS) under the observation of the UXOQC and SUXOS. All instruments tested satisfactorily, and the 2 UXO teams, archeologists, UXOQC, UXOQC Assistant, and the UXOSO departed for AOC3 to prepare for the days' operations.

The explosive vehicle arrived on site and was parked on the road at the southwest corner of AOC3 (the established firing point). The SUXOS, UXOQC Assistant 2, and 1 UXO Technician returned to the firing point, picked up the required explosives, and proceeded back to the demolition site. The SUXOS directed Team 2 to check, identify, and clear any obstacles from the path leading up to the Waikane Spring that may have been moved due to the early morning rain. Team 1 prepared the demolition site by filling sandbags, excavating an area to place the demolition item (practice 3.5-inch), and identifying an area to test the blasting caps. The archeologists were consulted to ensure soil used for the sandbags did not impact or disturb any local protected plant species. The test light bulb was inserted into the Remote Firing Device (RFD) and a successful test fire of the radio frequency firing circuit was conducted. The Demolition Team members (UXO Team 1 Team Leader, UXOQC Assistant and 2 UXO personnel remained at the demolition site with the remainder of SUXOS and archeologists returned to the firing point.

RAB members attending the day's scheduled site visit met at the parking lot of the Church located on Waikane Valley Road. A total of 8 public RAB members were in attendance, additionally 5 personnel from MCBH Environmental Department and 1 representative from NAVFAC Pacific (see Site Visitors Log for personnel names).

Major Hudock from MCBH Environmental Department was the lead for the Site Visit. Once introductions were made, Major Hudock turned the site visit briefing and orientation over to USA Environmental. USAE Project Manager presented an introduction to the RAB members in attendance on what to expect during the day's site visit evolutions. The UXO Safety Officer gave a safety brief to all RAB members (visitors). From the Church parking lot, the site visit personnel were transported to the project site by project vehicles.

At the project site the USAE Site Manager gave the participants and overall brief of the areas that were to be visited, and gave a brief description of what our Scope of Work for the project involved, and what we expect to gain from our work on site.

The participants visited the project Instrument Test Strip (ITS) were the Site Manager gave a detailed brief on the construction of the ITS, the purpose of the ITS, and how it was used on a daily basis. A detailed brief of the Schonstedt and White's All-Metal hand-held detectors was given to the site visit personnel. Also while at the ITS, Wil Chee Planning gave a demonstration on the equipment and procedures that would be employed during field sampling operations as well as the type of soil and sediment samples that would be collected. The Site Manager and Project Manager fielded and answered many questions while at the ITS.

From the ITS location, the site visit personnel were transported along the southern boundary road by project vehicles to meet USAE SUXOS and the rest of the field team. The field team members then escorted all site visit personnel to AOC 3. Once at AOC 3, the SUXOS briefed the visitors on the item to be disposed of, the layout of the demolition shot to include explosives used and the operation of the RFD. After answering questions, the SUXOS directed Team 1 to escort those visitors who desired to proceed up the mountain to view the Waikane Spring. The SUXSO and Demolition Team remained at the demolition site and all remaining personnel returned to the firing point. The demolition shot was prepared and the SUXOS and Demolition Team returned to the firing point, the required radio notices were conducted the demolition shot was successfully completed. The UXOSO and demolition Supervisor returned to verify the demolition site was clear. Upon receiving "all clear" from the UXOSO, all personnel returned to the demolition site to observe the results. The SUXOS answered any questions and all personnel returned to the firing point.

Upon conclusion of the post explosive demolition observance and briefing, the site visit personnel were transported back to the Church parking lot. At the Church parking Major Hudock and the USAE Project Manager instructed the participants that the site visit was completed and conducted brief closing remarks. The outcome of the site visit appeared to be very successful, and was worth the time and effort by all organizers and participants. The RAB members in attendance had very positive feed back at the end.

All personnel returned to the staging area, loaded the vehicles, and departed for the Self-Storage rental unit to store equipment then departed for the rental condominium units in Waikiki.

6. Signature / Date:

___________ Daniel Miller_____________ **Date:** 3/18/2010

Site Manager

DAILY OPERATIONS SUMMARY

DATE: Monday, 3/22/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC 1	0	0
(b) AOC2	0	0
(c) AOC3	6%	24%
(d) AOC4	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	0

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan and MEC Sampling Analysis Plan. Continue conducting surface sweep operations within the boundaries of Area of Concern (AOC) 3.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located:

Type:	Quantity:	Live/Prac.	Remarks:
Rocket, AT, 3.5", fired, motor expended, intact warhead, practice fuze.	10 each	MPPEH Unknown Filler	All items consolidated within AOC 3 until venting and/or demilitarization can be conducted at a later date.
Warhead, Rocket, 2.36", HEAT (no fuze and no rocket motor)	1 Each	Suspect HE Filler	Item consolidated within AOC 3 until disposal, venting and/or demilitarization can be conducted at a later date.

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep within AOC 3.	Various	120 Lbs.	All MD recovered during the days operations were inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	0	0	0	0
SUXOS	115 / 5.2	11	3	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	5.5	5.5	0	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	4	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	5.5	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble GeoXH GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	1	11	
Printer	6210-115	1	10	

5. **Operational Remarks:**

All personnel assembled behind the Ilikai Condominium complex and departed for the designated Daily Safety brief site in Kanehoe and met the archeologists. The UXOSO, Medic, and four UXO Technicians picked up equipment at the storage unit and proceeded to the Safety brief site. Upon arriving at the site, the UXOSO conducted the Safety Brief followed by the SUXOS planned daily operations brief.

After completion of these briefs, all personnel departed for the staging area in the Waikane Valley Impact Area.

All Schonstedts were tested in the Instrument Test Strip (ITS) under the observation of the UXOQC and SUXOS. All instruments tested satisfactorily, and the 2 UXO Teams, 2 archeologists, and UXOQC Assistant departed for AOC3.

Surface sweep operations were conducted and approximately 6% of AOC3 was completed.

All personnel returned to the staging area, loaded the vehicles, and departed for the Self-Storage rental unit to store equipment, then departed for the rental condominium units in Waikik.

6. **Signature / Date:**

__________David Wilson______________ **Date:** 3/22/2010
SUXOS

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 3/23/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC 1	0	0
(b) AOC2	0	0
(c) AOC3	4%	28%
(d) AOC4	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	0

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan and MEC Sampling Analysis Plan. Continue conducting surface sweep operations within the boundaries of Area of Concern (AOC) 3 north of Waikane Stream.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:**

Type:	Quantity:	Live/Prac.	Remarks:
Rocket, HEAT, 3.5", fired, motor expended, intact warhead, practice fuze.	6 each	MPPEH Unknown Filler	All items consolidated within AOC 3 until venting and/or demilitarization can be conducted at a later date.
Rocket, 2.36", HEAT, motor expended, fuze intact, filler unknown	2 each	UXO Suspected HE Filler	Item will be disposed of (BIP) during demolition operations on Thursday, 25 March
Warhead, rocket, 2.36", HEAT (no fuze, no rocket motor)	2 each	MPPEH Unknown Filler	All items consolidated within AOC 3 until venting and/or demilitarization can be conducted at a later date.
Warhead, rocket, 3.5", HEAT (no fuze, no rocket motor)	1 each	MPPEH Unknown Filler	All items consolidated within AOC 3 until venting and/or demilitarization can be conducted at a later date.

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep within AOC 3.	Various	100 Lbs.	All MD recovered during the days operations were inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	0	0	0	0
SUXOS	115 / 5.2	11	3	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	0	0	0	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	4	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	0	0	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble GeoXH GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	1	11	
Printer	6210-115	1	10	

5. **Operational Remarks:**

All personnel assembled behind the Ilikai Condominium complex and departed for the designated Daily Safety brief site in Kanehoe and met the archeologists. The UXOSO, Medic, and four UXO Technicians picked up equipment at the storage unit and proceeded to the Safety brief site. Upon arriving at the site, the UXOSO conducted the Safety Brief followed by the SUXOS planned daily operations brief.

After completion of these briefs, all personnel departed for the staging area in the Waikane Valley Impact Area.

All Schonstedts were tested in the Instrument Test Strip (ITS) under the observation of the UXOQC and SUXOS. All instruments tested satisfactorily, and the 2 UXO Teams, 2 archeologists, and UXOQC Assistant departed for AOC3.

Surface sweep operations were conducted and approximately 4% of AOC3 was completed. The teams were working in the northeast portion of the AOC and dense vegetation and steep slopes accounted for the lower completion percentage.

All personnel returned to the staging area, loaded the vehicles, and departed for the Self-Storage rental unit to store equipment, then departed for the rental condominium units in Waikik.

6. **Signature / Date:**

___________ David Wilson_____________ **Date:** 3/23/2010
SUXOS

DAILY OPERATIONS SUMMARY

DATE: Wednesday, 3/24/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC 1	0	0
(b) AOC2	0	0
(c) AOC3	10%	38%
(d) AOC4	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	0

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan and MEC Sampling Analysis Plan. Continue conducting surface sweep operations within the boundaries of Area of Concern (AOC) 3 north of the Waikane Stream.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:**

Type:	Quantity:	Live/Prac.	Remarks:
Rocket, HEAT, 3.5”, fired, motor expended, intact warhead, practice fuze.	7 each	MPPEH Unknown Filler	All items consolidated within AOC 3 until venting and/or demilitarization can be conducted at a later date.
Warhead, rocket, 2.36”, HEAT (no fuze, no rocket motor)	1 each	MPPEH Unknown Filler	Item consolidated within AOC 3 until venting and/or demilitarization can be conducted at a later date.

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep within AOC 3.	Various	110 Lbs.	All MD recovered during the days operations were inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	0	0	0	0
SUXOS	115 / 5.2	11	4	0	7
UXO Technician III	115 / 5.3	20	6	0	14
UXO Technician II	115 / 5.3	30	9	0	21
UXO Technician II	115 / 5.2	10	3	0	7
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	12	0	28
UXOQCS	115 / 5.2	10	3	0	7
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	3	0	7
DEI / UXO Tech II	115 / 5.3	0	0	0	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	4	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	0	0	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble GeoXH GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	1	11	
Printer	6210-115	1	10	

5. **Operational Remarks:**

All personnel assembled behind the Ilikai Condominium complex and departed for the designated Daily Safety brief site in Kanehoe and met the archeologists. The UXOSO, Medic, and four UXO Technicians picked up equipment at the storage unit and proceeded to the Safety brief site. Upon arriving at the site, the UXOSO conducted the Safety Brief followed by the SUXOS planned daily operations brief.

After completion of these briefs, all personnel departed for the staging area in the Waikane Valley Impact Area.

All Schonstedts were tested in the Instrument Test Strip (ITS) under the observation of the UXOQC and SUXOS. All instruments tested satisfactorily, and the 2 UXO Teams, 2 archeologists, and UXOQC Assistant departed for AOC3.

Surface sweep operations were conducted and approximately 10% of AOC3 was completed. Upon completion of surface sweep operations, the SUXOS gave a detailed brief on disposal operations to be conducted on Thursday, 25 March.

All personnel returned to the staging area, loaded the vehicles, and departed for the Self-Storage rental unit to store equipment, then departed for the rental condominium units in Waikik.

6. **Signature / Date:**

___________ David Wilson__ ___________ **Date:** 3/24/2010
SUXOS

DAILY OPERATIONS SUMMARY

DATE: Thursday, 3/25/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC 1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0%**	**38%**
(d) AOC4	**0**	**0**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**0**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**2**	**2**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan and MEC Sampling Analysis Plan. Complete explosive blow-in-place (BIP) disposal operations of two (2) UXO items in Area of Concern (AOC) 3. Wil Chee Planning conduct pre and post detonation soil sampling at each of the BIP locations.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC or MPPEH items located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:
Detonator, Electric, No Delay	2 Each	
Perforator, RDX Shape Charge, 32 gram	2 Each	
Cord, Detonating, 80 grain	20 Feet	

c. MD/Scrap Generation/Disposition: Only demolition operations were conducted.

Type:	Quantity:	Weight:	Remarks:
Munitions Debris generated from explosive disposal of 2 UXO items.	Various Pieces	. 15 Lbs.	All MD recovered during the days operations were inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
    a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	0	0	0	0
SUXOS	115 / 5.2	11	3	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	10	4	0	6
Wil Chee Planning	115 / 5.5	5	5	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115	0	0	0	0

    b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	4	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble GeoXH GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	1	11	
Printer	6210-115	1	10	

5. Operational Remarks:

All personnel assembled behind the Ilikai Condominium complex and departed for the designated Daily Safety brief site in Kanehoe and met the archeologists. The UXOSO, Medic, and four UXO Technicians picked up equipment at the storage unit and proceeded to the Safety brief site. Upon arriving at the site, the UXOSO conducted the Safety Brief followed by the SUXOS planned daily operations brief to include a detailed demolition operations brief.

After completion of these briefs, all personnel departed for the staging area in the Waikane Valley Impact Area.

The 2 UXO Teams, 2 archeologists, and the UXOQC Assistant departed for AOC3 to fill sandbags to mitigate the demolition shots. Upon arrival of the DEI, a test of the Remote Firing Device (RFD) was conducted at each disposal site with satisfactory results. Clayton Sugimoto from Wil Chee Planning was picked up at the Safety Brief area and transported to the site where he conducted pre detonation soil sampling of both disposal areas. The SUXOS called the Kanehoe Marine EOD Detachment, the Kanehoe Police Department, and the Kanehoe Fire Department. The Kanehoe Fire Department requested the SUXOS contact the Hawaii Fire Department Communications Center and to use them for all future notifications.

The UXOQC established a road guard position inside the entrance gate and the Demolition Supervisor (Ken Jones) and the remainder of the demolition Team (Pono Hui and Jason DeHerrea) departed to setup the two demolitions. Both shots were successful and post detonation soil samples were taken by Wil Chee employee Clayton Sugimoto. The remainder of the UXO personnel cleaned up the shot areas.

All personnel returned to the staging area, loaded the vehicles, signed time cards, and departed for the Self-Storage rental unit to store equipment, then to the rental condominium units in Waikik.

6. Signature / Date:

___________David Wilson______________ **Date:** 3/25/2010

SUXOS

DAILY OPERATIONS SUMMARY

DATE: Monday, 3/29/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC 1	0	0
(b) AOC2	0	0
(c) AOC3	4%	42%
(d) AOC4	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	2

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan and MEC Sampling Analysis Plan. Continue conducting surface sweep operations within the boundaries of Area of Concern (AOC) 3.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located:

Type:	**Quantity:**	**Live/Prac.**	**Remarks:**
Rocket, HEAT, 3.5-inch, motor expended, intact warhead and fuze.	6 each	UXO Suspect HE Filler	All items left in place where located. Explosive disposal (BIP) operations will be conducted on all 6 items Tuesday, 30 March.

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep within AOC 3.	Various Pieces	. 140 Lbs.	All MD recovered during the days operations were inspected for energetic material, and consolidated within the AOC until disposition at a later date

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	11	4	0	7
UXO Technician III	115 / 5.3	20	6	0	14
UXO Technician II	115 / 5.3	30	9	0	21
UXO Technician II	115 / 5.2	10	3	0	7
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	12	0	28
UXOQCS	115 / 5.2	10	3	0	7
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	3	0	7
DEI / UXO Tech II	115 / 5.3	10	3	0	7
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	4	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble GeoXH GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

All personnel assembled behind the Ilikai Condominium complex and departed for the designated Daily Safety brief site in Kanehoe and met the archeologists. The SUXOS, Medic, and four UXO Technicians picked up equipment at the storage unit and proceeded to the Safety Brief site. Upon arriving at the site, the UXOSO conducted the Safety Brief followed by the SUXOS planned daily operations brief.

After completion of these briefs, all personnel departed for the staging area in the Waikane Valley Impact Area.

All Schonstedts were tested in the Instrument Test Strip (ITS) under the observation of the UXOQC and SUXOS. All instruments tested satisfactorily, and the 2 UXO Teams, 2 archeologists, and UXOQC Assistant departed for AOC3.

The UXO Teams continued surface sweep operations within AOC3. The teams completed the surface sweep of approximately .5 acres or 4% within AOC3. During the days surface sweep operations, the teams located a total of 6 MEC (UXO) items requiring that they be explosively disposed of in place (BIP) where each of the UXO items were located. The BIP disposal operations are scheduled to take place on Tuesday 30 March along with the consolidation explosive venting/disposal operations on items that were deemed acceptable to move during the last two weeks of surface sweep operations within AOC3.

At the completion of the day’s on-site operations, the SUXOS conducted a detailed brief on explosive disposal operations to be conducted on Tuesday, 30 March.

All personnel returned to the staging area, loaded the vehicles, and departed for the Self-Storage rental unit to store equipment, then departed for the rental condominium units in Waikiki.

6. **Signature / Date:**

__________ David Wilson_____________ **Date:** 3/29/2010
SUXOS

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 3/30/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC 1	0	0
(b) AOC2	0	0
(c) AOC3	0%	42%
(d) AOC4	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	2

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Conduct explosive disposal operations at the MCBH Waikane Valley Impact Area per the project Work Plan and MEC Sampling Analysis Plan in Area of Concern (AOC) 3.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC or MPPEH items located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:
Detonator, Electric, No Delay	6 Each	
Perforator, RDX Shape Charge, 32 gram	66 Each	
Cord, Detonating, 80 grain	430 Feet	

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Munitions Debris generated from the day's explosive demolition disposal operations.	Various Pieces	. 950 Lbs.	All MD recovered during the days operations were inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	14	14	0	0
SUXOS	115 / 5.2	13	5	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	4	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble GeoXH GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

The RI field team continued MEC surface clearance operations within AOC3 at the Former Waikane Valley Impact Area.

Two personnel from ECC (Mr. Mike Rockett and Mr. Terry Stark) were on site today to commence the project Quality Assurance inspection. The ECC team was given an overall project briefing and site operations briefing by the Site Manager and SUXOS. Through out the day the ECC team went over the QA inspection check list with the Site Manager, SUXOS and UXOQCS.

The UXO Teams commenced the set up for explosive disposal operations by filling sandbags and testing the USAE Remote firing Devices (RFDs). Both RFDs tested satisfactory for a good RF link to the Master Controller at the designated firing point. Upon arrival of the explosives by DEI (Donaldson Enterprises, Inc.) team members returned to the firing point and the SUXOS conducted the Demolition Operations Brief. Both teams then returned to AOC3 with the required explosives for the day's operations. Additionally, Team 1 conducted a test of DEIs RFD with satisfactory results.

A total of three demolition disposal shot were prepared. Two separated demolition shots were prepared for all the items requiring BIP. The third demolition disposal shot was prepared as consolidation shot for all MPPEH items recovered to date.

For a specific list of all MEC (UXO) and MPPEH items disposed of today by explosive detonation refer to MEC SAP SOP 6 Attachment 5, Explosive Disposal Log (Attached).

All three explosive demolition shots were successful. Upon inspection of the detonations, all 6 of the separate BIPs were confirmed as practice 3.5" rockets, all 84 of the 3.5" rockets and the single M29 rifle grenade in the consolidated shot were confirmed as practice. The 4-2.36 "HEAT rocket warheads, 1-3.5" HEAT rocket warhead and the 2- 2.36" HEAT rocket fuzes with detonator attached to rocket motor were confirmed as containing high explosives. Upon completion of demolition operations all UXO Team members returned to the demolition disposal operation areas and picked up the sand sandbags and collected the generated MD.

All personnel returned to the staging area where the SUXOS conducted a debriefing of the day's operations. All personnel departed the site and proceeded to the self-storage rental where the equipment from the day's operations was secured.

6. **Signature / Date:**

___________David Wilson_____________ **Date:** 3/30/2010

SUXOS

DAILY OPERATIONS SUMMARY

DATE: Wednesday, 3/31/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	0	0
(b) AOC2 (7.9 acres)	0	0
(c) AOC3 (8.4 acres)	0.4 acres	4.0 acres
(d) AOC4 (5.1 acres)	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	2

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue conducting surface sweep operations in accordance with the approved MEC Sampling Analysis Plan within the boundaries of Area of Concern (AOC) 3.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located:

Type:	Quantity:	Live/Prac.	Remarks:
Rocket, HEAT, 2.36 inch, motor expended, intact warhead and fuze.	1 each	UXO Suspect HE Filler	Item left in place where located within AOC3. Explosive disposal (BIP) operations will be conducted on item Thursday, 01 April.

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep operations within AOC3.	Various Pieces	. 450 Lbs.	All items were inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	14	14	0	0
SUXOS	115 / 5.2	12	4	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	26	6	0	20
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	6204-113	4	0	4	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	0	0	0	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
AECOS	6204-113	6	6	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	4	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	0	0	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble GeoXH GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. Operational Remarks:

The RI field team continued MEC surface clearance operations within AOC3 at the Former Waikane Valley Impact Area.

The DEI UXO Technician II was not on-site again today as his ankle, which he twisted on 17 March) has not fully recovered according to him. DEI corporate Project Manager was not aware that the UXO Technician II assigned to the project had not shown up for his field duties this day. However, he has been available to provide explosives for our scheduled explosive demolition disposal days. Not knowing when a DEI employee (UXO Tech II) will be present on-site for routine contracted daily field operations is becoming an issue with regards to planning site operations and support to other USA Environmental sub-contractors or other contractors involved in daily operations on site. The DEI corporate person responsible to USAE for the Waikane Valley project support has been notified on two separate occasions with regards to this issue, but to date the problem has not been resolved. *Recommend modifying DEI's current contract without any operational support on non-explosive demolition days and to only provide commercial explosive provisions, to include at a minimum the use of an electric detonator field carrying container, Remote Firing Device, electric firing wire, crimpers and galvanometers; commercial explosive storage; and commercial explosive transportation and delivery by a qualified State of Hawaii explosive blaster to the project site on scheduled explosive demolition days (minimum of once per week) utilizing a 4WD pick-up truck capable of transporting commercial explosives over public transportation routes in accordance with state and DOT regulations. Upon transportation and delivery of commercial explosives to the project site, the DEI employee will remain on site as the Sate of Hawaii qualified explosive blaster with no direct involvement in demolition operations. At the completion of the day's explosive demolition operations, the DEI employee will return to proper storage any unused commercial explosives and demolition equipment delivered to the site on that day.*

Eric Guinther from AECOS, escorted by Raul Martinez (UXO Tech II) was on-site in the morning to continue with the Natural Resources Survey within the boundaries of the project site contracted under the Waikane Valley Impact Area Site Investigation Contract Task Order 004. Eric completed the survey at the higher elevations greater than 400 feet above AOCs 1 and 2. Eric may return next week to complete the survey above AOCs 3 and 4.

Two personnel from ECC (Terry Stark and Michael Rockett) were conducting QA administrative duties and were not on site today.

Surface sweep operations were conducted in the north central area of AOC3, approximately .4 acres in that area of AOC3 was completed. The UXOQC Assistant logged GPS points to identify areas that have a greater than 30-degree slope.

All personnel returned to the staging area where the SUXOS, Site Manager and the UXOQC conducted a debriefing of the day's operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. Signatures / Date:

___________ David Wilson_____________ **Date:** 3/31/2010

SUXOS

___________ Daniel Miller____________ **Date:** 4/02/2010

Site Manger

Field Daily Reports

April 2010

DAILY OPERATIONS SUMMARY

DATE: Thursday, 4/01/2010 **PAGE 1 OF 6 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:

Work Accomplished	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	0	0
(b) AOC2 (7.9 acres)	0	0
(c) AOC3 (8.4 acres)	.35 acres	4.35 acres
(d) AOC4 (5.1 acres)	0	0
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	0
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	0	2

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue conducting surface sweep operations in accordance with the approved MEC Sampling Analysis Plan within the boundaries of Area of Concern (AOC) 3. Conduct and complete explosive blow-in-place (BIP) and consolidation disposal operations on all UXO and MPPEH items identified during the weeks operations within AOC 3.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:**

Type:	**Quantity:**	**Live/Prac.**	**Remarks:**
Rocket, HEAT, 2.36 inch, motor expended, intact warhead and fuze.	1 each	UXO Suspect HE Filler	Item left in place where located in southern area of AOC3 and explosive disposal (BIP) operation on item was conducted Thursday, 01 April.
Warhead, Grenade, Rifle, M9	1 each	MPPEH Filler Unknown	Item consolidated with 1 BIP location, and explosive disposal of item was conducted on Thursday, 01 April.

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:
Detonator, Electric, No Delay	4 Each	
Perforator, RDX Shape Charge, 32 gram	3 Each	
Cord, Detonating, 80 grain	20 Feet	

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep operations within AOC 3.	Various Pieces	. 320 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.
Munitions Debris generated from the day's explosive demolition disposal operations within AOC3.	Various Pieces	20 Lbs	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	11	3	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
NHV / UXOSO	115 / 5.2	10	2	0	8
DEI / UXO Tech II	115 / 5.3	10	10	0	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	4	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. Operational Remarks:

The RI field team continued MEC surface clearance and explosive disposal operations within AOC3 at the Former Waikane Valley Impact Area project site.

Two personnel from ECC (Terry Stark and Michael Rockett) contracted by NAVFAC Pacific to perform project Quality Assurance (QA) oversight were on-site to continue the QA process of the project and ongoing field operations. Mr. Stark spent the entire day with the Site Manager going over operations and discussing the work plan, and Mr. Rockett accompanied the project QC assistant in the field for the entire day's operations both as part of the QA process.

Lawrence Gillermo from Pacific Helicopter was also on-site today for 1.5 hours to conduct a site visit and discuss the whether or not Pacific Helicopter could provide helicopter logistics support to the project field work. The Site Manager discussed with Mr. Gillermo that we need support in the way of slinging recovered munitions debris scrap from multiple consolidation point locations within the cleared AOCs, to a designated processing area outside the project site boundaries but within Waikane Valley to facilitate conducting a final inspection, packaging and transportation off-site all recovered munitions debris for shipment to a demilitarization facility. Also discussed was that there maybe a need to sling filled sand bags into the project site areas. Mr. Gillermo stated that Pacific Helicopter would be able to provide the requested support, and stated the maximum lift of the helicopter that would be used is 800 pounds. While on-site Mr. Gillermo and Site Manager identified an area to the south of the project site where it would be safe to land the helicopter to hook and unhook the sling, and also to land in the event of an emergency. The area identified will require minor grass/brush cutting by the USAE crew. The scrap processing and helicopter landing areas identified within Waikane Valley for helicopter operations are both located approximately 1 mile or further from the entrance gate to Waikane Valley off of Waikane Valley Road. Prior to Mr. Gillermo departing the site, he stated to the Site Manager that he would discuss the requirements with their office in Maui and then get back with us on support they will provide and prices.

Surface sweep operations were conducted in the north central and northwest area of AOC3 prior to conducting explosive demolition operations. Approximately .35 acres of that area within AOC3 has been surface cleared and quality control checked. Surface clearance of a majority of the northern half of AOC3 is now completed. The UXOQC Assistant continued to collect GPS waypoints and tracklogs to identify areas that have a greater than 30-degree slope.

UXO Team 1 commenced the set up for explosive disposal operations by filling sandbags and testing the USAE Remote firing Devices (RFDs) while Team 1 continued with surface clearance operations within AOC3. Both RFDs tested satisfactory for a good RF link to the Master Controller at the designated firing point. Upon arrival of the explosives by DEI team members returned to the firing point and the SUXOS conducted the Demolition Operations Brief. The demolition team then returned to explosive demolition locations with the required explosives to prepare the 3 items for disposal by detonation.

A total of two explosive demolition disposal shots were conducted during the day's operations. For a specific list of all MEC (UXO) and MPPEH items disposed of today by explosive detonation refer to the Attachment 5 of the MEC SAP SOP 6, Explosive Disposal Log (attached).

Upon completion of firing both explosive disposal shots, the Demolition Team Leader along with another UXO team member inspected and verified both explosive demolition shots were successful. The inspection of the detonation sites revealed that the UXO item disposed of at the northern BIP location within AOC3 was confirmed as containing high explosives, and the UXO item and MPPEH item disposed of at the southern BIP/Consolidation location within AOC3 were confirmed as practice/inert items. Both UXO field teams returned to both explosive disposal areas to collect all sand sandbag remnants and all MD generated during the explosive disposal operations.

All personnel returned to the staging area where the SUXOS, Site Manager and UXOQCS conducted a debriefing of the day's operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. **Signatures / Date:**

___________David Wilson______________ **Date:** 4/01/2010
SUXOS

___________Daniel Miller_____ __ ______ **Date:** 4/02/2010
Site Manger

DAILY OPERATIONS SUMMARY

DATE: Monday, 4/05/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0**	**0**
(b) AOC2 (7.9 acres)	**0**	**0**
(c) AOC3 (8.4 acres)	**1 acre**	**5.35 acres**
(d) AOC4 (5.1 acres)	**0**	**0**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**0**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**2**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue conducting surface sweep operations in accordance with the approved MEC Sampling Analysis Plan within the boundaries of Area of Concern (AOC) 3.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:**

Type:	Quantity:	Live/Prac.	Remarks:
Grenade, Rifle, M28 HEAT, fuzed and fired.	1 each	UXO Suspect HE Filler	Item left in place where located in west/southwest area of AOC3 for explosive disposal (BIP) operations on Thursday, 08 April.

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep operations within AOC 3.	Various Pieces	. 550 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	0	0	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	11	3	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.3	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

b. Daily Equipment:

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

The RI field team continued MEC surface clearance operations within AOC3 at the Former Waikane Valley Impact Area project site.

The project UXO Safety Officer (UXOSO) position that had been sub-contracted to Native Hawaiian Veterans (NHV) Company has been cancelled, and now will be filled by an employee hired directly by USA Environmental (USAE). The present project UXO Quality Control Supervisor (UXOQCS) will temporarily be dual-hatted as the UXOQCS and UXOSO from 4-05-2010 through 4-08-2010 until at which time a replacement mobilizes on Sunday 11 April 2010.

Two personnel from ECC (Terry Stark and Michael Rockett) contracted by NAVFAC Pacific to perform project Quality Assurance (QA) oversight were on-site to continue the QA process of the project and ongoing field operations. Both accompanied the UXO Teams in the field to observe surface sweep operations, and departed the side at approximately 1315.

Surface sweep operations were conducted in the last two small unswept areas in the northern area of AOC3 and along a portion of the western boundary, completing approximately 1 acre area within AOC3. Surface clearance of the entire northern half of AOC3 is now complete with the exception of the areas identified as exceeding greater than a 30-degree slope. The northwest (NW) and northeast (NE) corners of AOC3 are now established and GPS positions recorded. One grid in the northwest portion of AOC3 has been established and GPS position data will be recorded tomorrow. This grid is approximately 30 feet wide by 100 feet long. Tomorrow (Tuesday, 6 April), a second grid of the same size will be marked and GPS position data recorded. This second grid will also be in the northern portion of AOC3. The UXOQC Assistant continued to collect GPS waypoints and tracklogs to identify areas that have a greater than 30-degree slope. There are two areas on the eastern boundary and one on the western boundary that have a slope greater than 30-degrees.

All personnel returned to the staging area where the SUXOS and UXOQCS conducted a debriefing of the day's operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

Upon departing the staging area, the access gate was found to be unlocked and open. The gate was locked after all project vehicles departed.

6. **Signatures / Date:**

___________David Wilson______________ **Date:** 4/05/2010

SUXOS

____________Daniel Miller____________ **Date:** 4/10/2010

Site Manager

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 4/06/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0**	**0**
(b) AOC2 (7.9 acres)	**0**	**0**
(c) AOC3 (8.4 acres)	**.5 acre**	**5.85 acres**
(d) AOC4 (5.1 acres)	**0**	**0**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**0**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**2**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue conducting surface sweep operations in accordance with the approved MEC Sampling Analysis Plan within the boundaries of Area of Concern (AOC) 3.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located:

Type:	Quantity:	Live/Prac.	Remarks:
Grenade, Hand, M30 Practice, fuze sheared off	1 each	MPPEH Filler unknown	Item consolidated with UXO rifle grenade located in the northern area of AOC3 on 4-05-2010. Item to be disposed by explosive disposal planned for 4-08-2010

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep operations within AOC 3.	Various Pieces	. 190 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	0	0	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	11	3	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.3	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White’s Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. Operational Remarks:

The RI field team continued MEC surface clearance operations within AOC3 at the Former Waikane Valley Impact Area project site.

Surface sweep operations were conducted in the southwest area and in one expansion area on the eastern boundary of AOC3, completing approximately.5 acres within AOC3. Surface sweep operations in AOC3 are 100% complete with the exception of the areas identified as exceeding a 30-degree slope. The project QC Assistant completed the collection of GPS waypoints and tracklogs to identify remaining areas that have a greater than 30-degree slope.

Based on terrain, and the slope/incline areas identified as greater than 30-degrees that were not surface swept in AOC3, the project field team anticipates placing approximately 7 grids of varying sizes not to exceed 50 feet by 50 feet in size at various locations within the surface swept areas of AOC3 in order to conduct sub-surface investigation sampling. The grid locations and sizes will be recorded at the completion of sub-surface intrusive sampling operations within each of the AOCs.

Reconnaissance was conducted to identify if there is a closer entry to AOC4 than continuing to use the current access point leading into AOC3. A new access point is available approximately 300-feet past where vehicle creek crossing point. This new entry point brings the UXO Teams to the southeast corner of AOC4.

All personnel returned to the staging area where the SUXOS and UXOQCS conducted a debriefing of the day's operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

Upon departing the staging area, the access gate located on Waikane Valley Road was found to be unlocked and open. The project team closed and locked the gate upon departure.

6. Signatures / Date:

___________David Wilson______________ **Date:** 4/06/2010
SUXOS

___________ Daniel Miller____ _______ **Date:** 4/10/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Wednesday, 4/07/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0**	**0**
(b) AOC2 (7.9 acres)	**0**	**0**
(c) AOC3 (8.4 acres)	**0 acres**	**5.85 acres**
(d) AOC4 (5.1 acres)	**1.25 acres**	**1.25 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**0**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**2**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Commence conducting surface sweep operations in accordance with the approved MEC Sampling Analysis Plan within the boundaries of Area of Concern (AOC) 4.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:**

Type:	Quantity:	Live/Prac.	Remarks:
Grenade, Rifle, M28 HEAT, fuzed and fired.	7 each	UXO Suspect HE Filler	All items left in place where located in southeast area of AOC4 to be explosively disposed of (BIP) at a latter date.

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep operations within AOC 4.	Various Pieces	. 130 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	0	0	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.2	11	3	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	11	3	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.3	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

b. Daily Equipment:

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White’s Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

The RI field team continued MEC surface clearance operations within AOC4 at the Former Waikane Valley Impact Area project site.

In the last few days the area has experienced extremely heavy rains during the evenings and early mornings. As a result, the stream has increased in both depth and velocity. A safety line has been attached to trees on either side of the stream to assist the field crew when crossing the stream.

Surface sweep operations were conducted in the southwest area and along the eastern boundary of AOC4. Approximately 1.25 acres of AOC4 have been surface cleared. The project QC Assistant traversed the western and northern boundaries, and the center of AOC4 to identify areas that have a greater than 30-degree slope. It appears that approximately **70% of the entire area of AOC4 has a slope greater than 30-degrees.** The only remaining area within AOC4 that is able to be surface swept is two (2) small areas in the northeast portion and one (1) small area in the southwest portion. Weather permitting; AOC4 will be completed at the end of field operations Thursday, 8 April.

All seven (7) HEAT rifle grenades located today were in the southeast area of AOC4. This area appears to may have been used as a target area for rifle grenades. The project team plans to establish sub-surface intrusive investigation grids in this area.

All personnel returned to the staging area where the SUXOS and UXOQCS conducted a debriefing of the day’s operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day’s operations was secured.

Upon departing the staging area, the access gate was found to be unlocked and open. The gate was locked after all project vehicles departed.

6. **Signatures / Date:**

___________David Wilson______________ **Date:** 4/07/2010
SUXOS

___________Daniel Miller____________ **Date:** 4/10/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Thursday, 4/08/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0**	**0**
(b) AOC2 (7.9 acres)	**0**	**0**
(c) AOC3 (8.4 acres)	**0 acres**	**5.85 acres**
(d) AOC4 (5.1 acres)	**.5 acres**	**1.75 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**0**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**2**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue conducting surface sweep operations in accordance with the approved MEC Sampling Analysis Plan within the boundaries of Area of Concern (AOC) 4.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located:

Type:	Quantity:	Live/Prac.	Remarks:
Grenade, Rifle, M28 HEAT, fuzed and fired.	1 each	UXO Suspect HE Filler	Item left in place where located in southwest area of AOC4 to be explosively disposed of (BIP) at a latter date.
Rocket, 3.5 inch HEAT, fuzed and fired, rocket motor expended.	1 each	UXO Suspect HE Filler	Item left in place where located in northern area of AOC3 to be explosively disposed of (BIP) at a latter date.

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep operations within AOC 4.	Various Pieces	. 60 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	0	0	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	26	6	0	20
UXO Technician II	115 / 5.2	11	3	0	8
UXO Technician II	6204-113	4	0	4	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOQCS	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.2	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	6	6	0	0

b. Daily Equipment:

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. Operational Remarks:

The RI field team continued and completed MEC surface clearance operations within AOC4 at the Former Waikane Valley Impact Area project site.

Eric Guinther from AECOS was on-site in the morning to continue with the Natural Resources Survey within the boundaries of the project site contracted under the Waikane Valley Impact Area Site Investigation Contract Task Order 004. Eric completed the survey at the higher elevations greater than 400 feet above AOCs 3 and 4. UXO Tech II John Keene provided UXO Escort/Avoidance support to Eric while conducting operations on site. To date AECOS still needs to complete the scoped Bird and Insect survey as contracted.

Surface sweep operations were conducted in the two (2) small areas in the northeast portion and one (1) small area in the southwest portion of AOC4, completing approximately .5 acres during the day's surface clearance operations. A single expansion area was required in the southwest area of AOC4 where one MEC (UXO) item was identified. Surface sweep operations in AOC4 are100% complete with the exception of the areas identified as having a greater than a 30-degree slope/incline designating them as an area not able to clear. The project QC Assistant collected GPS waypoints and tracklogs to identify the areas within AOC4 as having a greater than 30-degree slope/incline.

Based on terrain, and the slope/incline areas identified as greater than 30-degrees that were not surface swept in AOC4, the project field team anticipates placing four grids of varying sizes not to exceed 50 feet by 50 feet in size at various locations within the surface swept areas of AOC4 in order to conduct sub-surface investigation sampling. The grid locations and sizes will be recorded at the completion of sub-surface intrusive sampling operations within each of the AOCs.

All personnel returned to the staging area where the SUXOS and UXOQCS conducted a debriefing of the day's operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day's operations was secured. All vehicles were refueled and washed.

6. Signatures / Date:

___________David Wilson_______________ **Date:** 4/08/2010
SUXOS

____________Daniel Miller____________ **Date:** 4/10/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Monday, 4/12/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0**	**0**
(b) AOC2 (7.9 acres)	**1.35 acres**	**1.35 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.75 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.30 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**0**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**2**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Commence conducting surface sweep operations in accordance with the approved MEC Sampling Analysis Plan within the boundaries of Area of Concern (AOC) 2.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:**

Type:	Quantity:	Live/Prac.	Remarks:
Grenade, Rifle, M28 HEAT, fired, point initiating (PI) element of fuzing broken off, appears base detonating (BD) fuze is still intact.	1 each	UXO Suspect HE Filler	Item left in place where located in southeast area of AOC2 for explosive disposal operations (BIP) scheduled for Thursday, 15 April.
Mortar, 60MM, HE, fuze sheared off and fired.	1 each	MPPEH Suspect HE Filler	Item moved and consolidated with the UXO Item ID #23 located in northeast area of AOC3 for explosive disposal operations scheduled for Thursday, 15April.
Block, Demolition, TNT, M030, one-quarter pound. (Military explosive material probably left behind by Marine Corp during previous clearance operations in WVTA).	1 each	DMM Explosive Charge (TNT)	Item moved and consolidated with M28 rifle grenade UXO Item ID #11 located in southwest area of AOC32 for explosive disposal operations scheduled for Thursday, 15 April.

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep operations within AOC 2.	Various Pieces	. 400 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.

4. **Utilization**

   a. **Daily Man-hours:**

Labor Category:	**Task # 6210-**	**M/H Today:**	**M/H 0% :**	**M/H 4%**	**M/H 8%**
Site Manager	115 / 5.2	13	10	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.2	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

   b. **Daily Equipment:**

Description:	**Task:**	**Number of Units**	**Hours Used Ea:**	**Remarks:**
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

Randall Jenkins previously filling the UXOQC Assistant position is now filling the position as project UXOSO effective today 12 April 2010.

Robert Rice mobilized in as an UXO Technician II on Sunday 11 April 2010 to fill the position of project UXOQC Assistant vacated by Randall Jenkins who was moved to the project UXOSO position. Mr. Rice reported on-site today where he was briefed on the overall project operations to date and expected future operations. A review of the project Work Plan, Health and Safety Plan, Accident Prevention Plan, and Activity Hazard Analysis were conducted by the project UXO Safety Officer prior to Mr. Rice commencing work as the project UXOQC Assistant.

The RI field team commenced MEC surface clearance operations within AOC2 at the Former Waikane Valley Impact Area project site.

The project MEC Teams commenced surface clearance operations within the boundaries of AOC2. Two (2) areas in the southeast and one (1) area in the northeast portion of AOC2 were surface swept today, completing approximately 1.25 acres during the day’s operations. The project UXOQC Assistant accompanied by the project UXOSO traversed the AOC to identify the areas within AOC2 having a greater than 30-degree slope/incline. Approximately 60% of AOC2 is unsweepable due to areas with a greater than 30-degree slope.

All personnel returned to the staging area where the SUXOS and UXOQCS conducted a debriefing of the day’s operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day’s operations was secured. All vehicles were refueled and washed.

6. **Signatures / Date:**

___________David Wilson_____________ **Date:** 4/12/2010
SUXOS

___________ Daniel Miller____ _______ **Date:** 4/12/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 4/13/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0**	**0**
(b) AOC2 (7.9 acres)	**.63 acres**	**1.98 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.75 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.30 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**90 Increments**	**90 Increments**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**2 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue surface sweep operations within the boundaries of AOC2 in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located: No MEC/MPPEH items located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during surface sweep operations within AOC 2.	Various Pieces	. 250 Lbs.	All MD was inspected for energetic material, and consolidated within AOC 2 until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.2	10	2	4 (115/5.5)	4
Wil Chee Planning	115 / 5.5	14	14	0	0
CH2M Hill	115 / 5.3	7	7	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

The RI field team continued and completed MEC surface clearance operations within AOC2 at the Former Waikane Valley Impact Area project site.

Two (2) personnel from sub-contractor and teaming partner Wil Chee Planning (Clayton Sugimoto and Deena Kam) were on site today to collect sediment samples from within AOC5 (Waikane Stream). A total of 3 Composite Sediment Samples, one from each of the Waikane Stream AOC Decision Units (DU), Downstream DU, Midstream DU, and Upstream DU. Each of the three Composite Sediment Samples consisted of 30 increments randomly collected within each of the DUs.

A representative from sub-contractor and teaming partner CH2M Hill (Kan Liu) was on site today. Mr. Liu accompanied the Wil Chee Planning Team along with UXO Tech II Mike Donaldson during the Composite Sediment Sampling within the Waikane Stream AOC to observe and document sampling operations for inclusion into the RI/FS Final Report.

The MEC Teams completed surface clearance operations within the boundaries of AOC2, completing an approximate .63 acres area for an approximate total acreage of 1.98 surface cleared within AOC2. The remaining 5.95 acres within the idealized boundaries of AOC2 have been identified as greater than 30-degree slope, and unable to surface clear in accordance with the project MEC SAP. No MEC or MPPEH items were located during the day's operations.

Upon completion of surface clearance operations within AOC2, the MEC Teams spent the remainder of the day identifying an access route between AOC2 and AOC1. This proved to be an extremely difficult effort. The teams spent over two hours traversing the terrain to gain access to AOC1 which they achieved at the end of the work day. The terrain around and within AOC1 is extremely steep in a majority of the areas as identified during the SI. It is projected there are only two (2) or three (3) small areas than can be surface cleared. Surface clearance operations within AOC1 will commence on Wednesday 14 April.

All personnel returned to the staging area where the SUXOS and UXOQCS conducted a debriefing of the day's operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day's operations was secured. All vehicles were refueled and washed.

6. **Signatures / Date:**

___________David Wilson_______________ **Date:** 4/13/2010
SUXOS

___________Daniel Miller_____ _______ **Date:** 4/13/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Wednesday, 4/14/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**.27 acres**	**.27 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**2.67 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.75 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.30 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**90 Increments**
(4) Multi-Incremental Samples	**0**	**0**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**2 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Commence surface sweep operations within the boundaries of AOC1 in accordance with the approved MEC Sampling Analysis Plan (SAP).

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC/MPPEH items located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition: No MD/Scrap generated this day.

Type:	Quantity:	Weight:	Remarks:

4. **Utilization**

a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0% :	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.3	20	4	0	16
UXO Technician II	115 / 5.3	30	6	0	24
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.3	40	8	0	32
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.2	7	2	0	5
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	7	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

The RI field team commenced and completed MEC surface clearance operations within AOC1 at the Former Waikane Valley Impact Area project site.

UXO Technician II John D. Keene was taken by the Site Manager to a local outpatient medical clinic today (The Medical Corner-Kailua Clinic); where he was seen by a doctor for an infection on his right elbow. The infection he acquired is from the cut he received on his elbow when he fell to the ground during field operations on Tuesday 6 April 2010. The doctor prescribed antibiotics to Mr. Keene, and authorized him to return to his regular work duty with no restrictions. Prior to taking Mr. Keene to the outpatient clinic, the USA Environmental corporate Health and Safety Manager and well as the Human Resources Director was advised of the situation and authorized the Site Manager to proceed with taking Mr. Keene to the.

The MEC Teams completed a surface clearance of approximately .27 acres of the proposed 1.8 acres within the idealized boundaries of AOC1. The remaining 1.53 acres within the idealized boundaries of AOC1 has been identified as having a greater than 30-degree slope/incline and in accordance with the project MEC SAP will not be surface cleared. Within the area that was surface cleared, the teams identified an approximately 30 foot diameter surface area in the northeast portion of AOC1 that was densely covered with various expended/inert small arms projectiles; no small arms cartridge cases were noted in this area. Within the swept area of AOC1, no MEC, MPPEH or munitions debris larger than expended small arms ammunition was located or noted.

An attempt to re-acquire the MEC item that was noted northeast of AOC1 during the 2008 Site Investigation Reconnaissance was unsuccessful. The UXOQC Assistant conducted a thorough instrument assisted visual survey of the area surrounding the MEC location with negative results.

The MEC Teams returned to the staging area to receive an operational briefing from the SUXOS on the planned explosive disposal operations scheduled for Thursday 15 April. Upon completion of the briefing, both teams then returned to the UXO (BIP) location in AOC2 and the two UXO (BIP) locations in AOC3 with sandbags and 24” by 24” by ¾-inch plywood pieces to prepare protective measure enclosures for protecting nearby sensitive features from the three UXO (BIP) explosive disposal demolition shots.

At the end of the day’s field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQCS conducted a debriefing of the day’s operations. All personnel departed the site and proceeded to the self-storage rental unit where the equipment from the day’s operations was secured.

6. **Signatures / Date:**

___________David Wilson_____________ **Date:** 4/14/2010
SUXOS

___________ Daniel Miller_____ _______ **Date:** 4/14/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Thursday, 4/15/2010 **PAGE 1 OF 6 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	0 acres	.45 acres
(b) AOC2 (7.9 acres)	0 acres	2.67 acres
(c) AOC3 (8.4 acres)	0 acres	5.75 acres
(d) AOC4 (5.1 acres)	0 acres	1.30 acres
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2	0	0
(c) AOC3	0	0
(d) AOC4	0	0
(3) Sediment Samples	0	90 Increments
(4) Multi-Incremental Samples	0	0
(5) Subsurface Samples	0	0
(6) Blow-In-Place Samples	8 Discreet	10 Discreet

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Conduct and complete explosive disposal operations on all MEC (UXO) and MPPEH items identified during field operations period of 4-5-2010 through 4-15-2010 within AOC2, AOC 3, and AOC4.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located: No MEC (UXO)/MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:
Cap, Blasting, Electric, No Delay	10 Each	
Perforator, RDX Shape Charge, 19.5 gram	13 Each	
Cord, Detonating, 80 grain	150 Feet	

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Munitions Debris generated from the day's explosive demolition disposal operations within AOC2, AOC3 and AOC4.	Various Pieces	40 Lbs.	All MD was inspected for energetic material, and consolidated within each of the AOCs until disposition at a later date.

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	12	5	0	7
UXO Technician III	115 / 5.3	20	6	0	14
UXO Technician II	115 / 5.3	27	9	0	18
UXO Technician II	115 / 5.5	3	0	3	0
UXO Technician I	115 / 5.3	40	12	0	28
UXOSO	115 / 5.2	10	3	0	7
UXOQCS	115 / 5.2	10	3	0	7
UXO Technician II	115 / 5.2	10	3	0	7
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech III	115 / 5.2	10	3	0	7
Wil Chee Planning	115 / 5.5	10	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

The RI field team conducted explosive disposal demolition operations within AOC2, AOC3, and AOC4 at the Former Waikane Valley Impact Area project site.

A total of five separate explosive demolition disposal shots were conducted within three AOCs. The SUXOS divided the MEC Teams into three separate Demolition Teams for the day’s operations.

Demolition Team 1 was responsible for explosive disposal operations within AOC4 where two separate explosive demolition shots were conducted. The first explosive demolition disposal shot in the southeastern area in AOC4 consisted of seven MEC (UXO) items identified as M28 HEAT Rifle Grenades. Six of the M28 Rifle Grenades were confirmed to contain high explosives. The seventh Rifle Grenade was identified as a M29 Practice Rifle Grenade, and confirmed to contain no explosive/energetic material. The second explosive demolition disposal shot in the west/southwest area in AOC4 was a MEC (UXO) item identified as a M28 HEAT Rifle Grenade. The UXO item was confirmed to contain high explosives.

Demolition Team 2 was responsible for explosive disposal operations in AOC3 where two separate explosive demolition shots were conducted. The first explosive demolition shot in the northeastern area in AOC3 consisted of one MEC (UXO) item identified as a 3.5-inch HEAT Rocket and one MPPEH item identified as 60MM HE Mortar which was located in AOC2, but was consolidated with the 3.5” Rocket UXO item to dispose of it well clear of any sensitive site features. Both items were confirmed to contain high explosives. The second explosive disposal demolition shot in the southwestern area of AOC3 consisted of one MEC (UXO) item identified as a M28 HEAT Rifle Grenade, one MEC (DMM) item identified as a M030 Military Demolition Charge (¼ pound block of TNT) which was located in AOC2, but was consolidated with the M28 Rifle Grenade UXO item to dispose of well clear of any sensitive site features, and one MPPEH item identified as a M30 Practice Grenade with a small explosive charge contained within the Grenade body. Both the UXO and DMM items were confirmed to contain high explosives; the MPPEH item was confirmed to contain a very small explosive charge as depicted in the ordnance publication for the item.

Demolition Team 3 was responsible for explosive disposal operations within AOC2 where one explosive demolition disposal shot was conducted. The single explosive demolition shot in the southeastern area in AOC2 consisted of one MEC (UXO) item identified as M28 HEAT Rifle Grenade. The item was confirmed to contain high explosives.

For a specific list of all MEC (UXO) and MPPEH items disposed of today by explosive detonation refer to the Attachment 5 of the MEC SAP SOP 6, Explosive Disposal Log (attached).

Clayton Sugimoto from Wil Chee Planning, escorted by UXO Technician II Cory Sullenberger, was on site for the day’s explosive demolition disposal operations in order to collect the remaining 8 discreet pre-detonation and post-detonation samples from 8 separate Blow-In-Place explosive demolition disposal locations. The pre-detonation and post-detonation samples were collected from one location within AOC2, two locations within AOC3 and five locations within AOC4.

GPS waypoints were collected and logged in the project Soil Sample Accountability Log at each of the sample locations to include sample ID numbers for each of the sample locations. In addition to the 8 primary discreet pre-detonation and post-detonation samples, one quality control field duplicate sample as well as one Matrix Spike sample and one Matrix Spike Duplicate samples were collected. GPS waypoints and Sample ID numbers for these 3 samples were also logged in the project Soil Sample Accountability Log. During the day's soil sample collection operations, one of the project field Archeologist accompanied the Soil Sample Team at all times.

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQCS conducted a debriefing of the day's operations. All personnel departed the site, fueled and washed vehicles, then proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. **Signatures / Date:**

___________David Wilson_____________ **Date:** 4/15/2010
SUXOS

___________Daniel Miller_____ _______ **Date:** 4/15/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Monday, 4/19/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**.45 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.37 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.75 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.30 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**90 Increments**
(4) Multi-Incremental Samples	**12**	**12**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**8 Discreet**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Commence sub-surface investigation operations within the surface cleared areas of the AOCs. Conduct the installation of grids within each AOC and cut vegetation necessary in order to conduct sub-surface intrusive investigation operations. Conduct operations in accordance with the approved MEC Sampling Analysis. Commence multi-incremental soil sample collection operations within the surface cleared areas of each of the AOCs.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located: No MEC (UXO)/MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition: No MD/Scrap generated this day.

Type:	Quantity:	Weight:	Remarks:

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	13	13	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	24	6	0	18
UXO Technician II	115 / 5.5	6	0	6	0
UXO Technician I	115 / 5.4	40	8	0	32
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.4	10	2	0	8
Wil Chee Planning	115 / 5.5	30	30	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

b. Daily Equipment:

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. Operational Remarks:

The RI field team conducted grid installation and vegetation cutting operations in the surface swept areas within the boundaries of AOC 3 and AOC 4. The team also commenced multi-incremental soil sample collection operations within the surfaced cleared areas of the AOCs at the Former Waikane Valley Impact Area project site.

Clayton Sugimoto, Deena Kam, and Hiep Nguyen from Wil Chee Planning along with one project field archeologist, and escorted by UXO Technician II Raul Martinez completed the collection of multi-incremental (MI) samples from each of the Decision Units (DUs) located within AOC1 and AOC2. For MI sampling operations AOC1 consist of one DU; DU1. AOC2 consist of three DUs; DU2, DU3, and DU4. A total of 3 MI samples containing no less than 1 kg of soil each were collected from the four DUs today. MI sample ID numbers WVIA-M-001, WVIA-M-002, and WVIA-M-003 were collected from within DU1. MI sample ID numbers WVIA-M-004, WVIA-M-005, and WVIA-M-006 were collected from within DU2. MI sample ID numbers WVIA-M-007, WVIA-M-008, and WVIA-M-009 were collected from within DU3. MI sample ID numbers WVIA-M-010, WVIA-M-011, and WVIA-M-012 were collected from within DU4. On Tuesday 20 April, the field environmental sampling team will continue to collect MI samples from DUs located within the surface cleared areas of AOC3 and AOC4.

The MEC Teams, also accompanied by one project field archeologist, conducted grid installation and vegetation cutting for follow on sub-surface intrusive sampling operations. During the day’s operations, a total of six grids of various sizes were established within the surface cleared areas of AOC 4, and one grid within the surface cleared area of AOC 3. Additional grids will be established in AOC 3 tomorrow (Tuesday, 20 April). The location of grids established today is as follows:

AOC 4

Lower southeast surface swept area:	two (2) grids
Upper southeast surface swept area:	one (1) grid
Middle center surface swept area:	one (1) grid
Lower northeast surface swept area:	one (1) grid
Lower southwest surface swept area:	one (1) grid

AOC 3

Southeast surface swept area:	one (1) grid

At the end of the day’s field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQCS conducted a debriefing of the day’s operations. All personnel proceeded to the self-storage rental unit where the equipment from the day’s operations was secured.

6. Signatures / Date:

___________David Wilson______________ **Date:** 4/19/2010
SUXOS

___________Daniel Miller_____ _______ **Date:** 4/19/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 4/20/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**.45 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.37 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.75 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.30 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3	**0**	**0**
(d) AOC4	**0**	**0**
(3) Sediment Samples	**0**	**90 Increments**
(4) Multi-Incremental Samples	**18**	**30 MIS**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue sub-surface investigation operations within the surface cleared areas of the AOCs. Continue the installation of grids within each AOC and cut vegetation necessary in order to conduct sub-surface intrusive investigation operations. Conduct operations in accordance with the approved MEC Sampling Analysis. Continue multi-incremental soil sample collection operations within Decision Units the surface cleared areas of each of the AOCs.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO)/MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition: No MD/Scrap generated this day.

Type:	Quantity:	Weight:	Remarks:

4. **Utilization**

a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	12	12	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	23	6	0	17
UXO Technician II	115 / 5.5	0	0	7	0
UXO Technician I	115 / 5.4	40	8	0	32
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.4	10	2	0	8
Wil Chee Planning	115 / 5.5	16	16	0	0
CH2M Hill	115 / 5.3	8	8	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

The RI field team conducted grid installation and vegetation cutting/grubbing operations in the surface swept areas within the boundaries of AOC 3. The team also commenced multi-incremental soil sample collection operations within the surfaced cleared areas of the AOC 3 and AOC 4 at the Former Waikane Valley Impact Area project site.

The project UXO Quality Control Assistant conducted and completed the re-acquisition and item confirmation of three separate SI MEC (UXO) item locations. The first MEC location re-acquired is located approximately 170 meters north and northeast of AOC4, the second MEC location re-acquired is located approximately 25 meters north/northeast of AOC3, and the third MEC location re-acquired is located approximately 200 meters north from the northeast corner of AOC2. All three items re-acquired were investigated, and all three were confirmed as practice munitions items. A GPS waypoint was collected at each of the three re-acquisition locations, and a detailed description of each item was noted in the digital project MEC accountability log.

Clayton Sugimoto and Deena Kam from Wil Chee Planning, and Kan Liu from CH2M Hill, along with one project field archeologist, and escorted by UXO Technician II John Keene, completed the collection of multi-incremental (MI) samples in the remaining Decision Units (DUs) located within AOC4 and AOC3. For MI sampling operations AOC4 consisted of three DUs; DU8, DU9, and DU10. AOC3 also consisted of three DUs; DU5, DU6, and DU7. A total of 3 MI samples containing no less than 1 kg of soil each were collected from each of the DUs. MI sample ID numbers WVIA-M-013, WVIA-M-014, and WVIA-015 were collected from within DU8. MI sample ID numbers WVIA-M-016, WVIA-M-017, and WVIA-M-018 were collected from within DU9. MI sample ID numbers WVIA-M-019, WVIA-M-020, and WVIA-M-021 were collected from within DU10. MI sample ID numbers WVIA-M-022, WVIA-M-023, and WVIA-M-024 were collected from within DU5. MI sample ID numbers WVIA-M-025, WVIA-M-026, and WVIA-M-027 were collected from within DU6. MI sample ID numbers WVIA-M-028, WVIA-M-029, and WVIA-M-030 were collected from within DU7.

The MEC Teams, also accompanied by one project field archeologist, conducted grid installation and vegetation cutting/grubbing for follow on sub-surface intrusive sampling operations. During the day’s operations, a total of seven (7) grids of various sizes were established within the surface cleared areas of AOC3, Prior to the end of the day’s field operations, the MEC Team staged the vegetation grubbing equipment in AOC 2 to facilitate grid installation and vegetation grubbing within that AOC. The location of grids established today is as follows:

AOC 3

Southwest surface swept area:	one (1) grid
Middle northwest surface swept area:	two (2) grids
North central surface swept area:	one (1) grid
Northeast surface swept area:	two (2) grids
Northwest surface swept area:	one (1) grid

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQCS conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. Signatures / Date:

___________David Wilson_______________ **Date:** 4/20/2010
SUXOS

___________ Daniel Miller____ _______ **Date:** 4/20/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Wednesday, 4/21/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**0.47 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.49 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.70 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.35 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3 (8 grids)	**0**	**0**
(d) AOC4 (6 grids)	**6**	**6**
(3) Sediment Samples	**0**	**90 Increments**
(4) Multi-Incremental Samples	**0**	**30 MIS**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue sub-surface investigation operations in the established grids within the surface cleared area AOC4. Conduct operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located:

Type:	Quantity:	Live/Prac.	Remarks:
Grenade, Rifle, M28 HEAT, Fired and Fuzed.	1	HE Filler	Item left in place where located, Grid AOC4-6 for explosive disposal (BIP) operations at a later date.

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during intrusive operations within AOC 4.	Various Pieces	. 90 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.
		.	

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	13	13	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	30	6	0	24
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.4	40	8	0	32
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.4	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. Operational Remarks:

The RI field team conducted intrusive operations in the grids established within the boundaries of AOC 4.

The following grids were completed with results as listed below:

GRID ID #	# OF DIGS	UXO/MPPEH	MD (IN LBs).	MAJOR MD ITEMS
AOC4-1	45	NONE	10	1 ea. 3.5” Rocket Motor, 1 ea. M29 Practice Rifle Grenade, several large fragments of a M29 Practice Rifle Grenade.
AOC4-2	10	NONE	10	1 ea. 3.5” Practice Rocket.
AOC4-3	26	NONE	35	1 ea. 3.5” Practice Rocket, 1 ea. 3.5” Rocket Motor, 1 ea. large fragment from a 60MM Mortar.
AOC4-4	3	NONE	NONE	NONE
AOC4-5	6	NONE	NONE	NONE
AOC4-6	21	Grenade, Rifle, M28, HEAT	35	7 ea. 3.5” Rocket Motors, 1 ea. large fragment of a 75MM Projectile.

The project UXO Quality Control Assistant conducted and completed the re-acquisition and item confirmation of one SI MEC (UXO) item location in the Greater Than 30-Degree Slope Area within the southwestern area of AOC3. The item re-acquired was investigated, and confirmed as a practice munitions items. A GPS waypoint was collected at the re-acquisition location, and a detailed description of the item was noted in the digital project MEC accountability log.

At the end of the day’s field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQCS conducted a debriefing of the day’s operations. All personnel proceeded to the self-storage rental unit where the equipment from the day’s operations was secured.

6. Signatures / Date:

___________David Wilson__ ____________ **Date:** 4/21/2010
SUXOS

___________ Daniel Miller____ _______ **Date:** 4/21/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Thursday, 4/22/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**0.47 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.49 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.70 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.35 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3 (8 grids)	**6**	**6**
(d) AOC4 (6 grids)	**0**	**6**
(3) Sediment Samples	**0**	**90 Increments**
(4) Multi-Incremental Samples	**0**	**30 MIS**
(5) Subsurface Samples	**0**	**0**
(6) Blow-In-Place Samples	**0**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue sub-surface investigation operations in the established grids within the surface cleared area AOC3. Conduct operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located:

Type:	Quantity:	Live/Prac.	Remarks:
2.36-inch rocket motor (expended), no warhead, fuze and detonator attached.	1	MPPEH Filler Unknown	Placed at SW corner of Grid AOC3-4 for explosive disposal (BIP) operations at a later date.

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during intrusive operations within AOC 3.	Various Pieces	. 147 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.
		.	

4. **Utilization**
   a. **Daily Man-hours:**

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	??	??	0	0
SUXOS	115 / 5.2	10	2	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	30	6	0	24
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.4	40	8	0	32
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.4	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
AECOS	6204-113	0	0	0	0

   b. **Daily Equipment:**

Description:	Task:	Number of Units	Hours Used Ea:	Remarks:
SUV Vehicle 4WD	6210-115	5	10	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	10	
White's Detector	6210-115	5	10	
Trimble ProXRT GPS	6210-115	3	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	10	
Chain Saw	6210-115	2	10	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	12	
Office Desk/Chair	6210-115	1	10	
Digital Camera	6210-115	4	10	
Hand Held Radio	6210-115	8	10	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	10	
Team Operating Equipment	6210-115	2	10	
Laptop Computer	6210-115	2	12	
Printer	6210-115	1	10	

5. **Operational Remarks:**

The RI field team conducted intrusive operations in the grids established within the boundaries of AOC 3.

The following grids were completed with results as listed below:

GRID ID #	# OF DIGS	UXO/MPPEH	MD (IN LBs).	MAJOR MD ITEMS
AOC3-1	15	NONE	7	Several large fragments of 3.5” rockets.
AOC3-2	13	NONE	25	Several large fragments of 3.5” rockets, pieces of a 55-gallon drum.
AOC3-4	65	2.36” rocket motor, no warhead. With fuze and detonator intact	55	Several large fragments of 3.5” rockets, 1 ea. 60MM mortar fins, several large fragments of 75 MM projectiles. **NOTE** 3.5” rocket under roots of 18-inch diameter tree. Cone missing, positively identified as practice. Would require cutting down tree to remove. Left in place. Photograph and GPS point taken.
AOC3-5	26	NONE	20	Several large fragments of 3.5” rockets, 1 ea. 60MM mortar fins, several large fragments of 75 MM projectiles.
AOC3-6	26	NONE	20	2 ea. 3.5”practice rockets.
AOC3-8	17	NONE	20	2 ea. 3.5”practice rockets, 2 ea. 3.5” rocket motors.

At the end of the day’s field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQC conducted a debriefing of the day’s operations. All personnel proceeded to the self-storage rental unit where the equipment from the day’s operations was secured.

6. **Signatures / Date:**

___________David Wilson__ ___________ **Date:** 4/22/2010
SUXOS

___________ Daniel Miller____ _______ **Date:** 4/22/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Monday, 4/26/2010 **PAGE 1 OF 6 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**0.47 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.49 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.70 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.35 acres**
(2) Subsurface Investigation		
(a) AOC1	**0**	**0**
(b) AOC2	**0**	**0**
(c) AOC3 (8 grids)	**2**	**8**
(d) AOC4 (6 grids)	**0**	**6**
(3) Sediment Samples	**0**	**03 Composite**
(4) Multi-Incremental Samples	**0**	**30 MIS**
(5) Subsurface Samples	**14**	**14 Discreet**
(6) Blow-In-Place Samples	**0**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Complete sub-surface investigation operations in the established grids within the surface cleared area AOC3. Commence grid establishment and vegetation cutting/grubbing operations within AOC2. Commence sub-surface soil sampling boring collection in all AOCs. Commence survey of grids established in AOC3 and AOC4. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:**

Type:	Quantity:	Live/Prac.	Remarks:
2.36-inch Rocket Warhead with fuze attached. No rocket motor attached. Assumed fired.	1	UXO Filler Unknown	Left in place to be BIP at a later date. Item located outside the surface swept areas. Item located by the Soil Sample Team while traversing between AOC2 to AOC3.
3.5-inch Rocket fuzed and fired.	1	UXO Filler Unknown	Left in place to be BIP at a later date. Item located by the UXOQC Assistant approximately 20 meters north from the northeast corner of AOC3.

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during intrusive operations within AOC3.	Various Pieces	. 135 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	14	14	0	0
SUXOS	115 / 5.2	12.5	4.5	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	13	4	4	5
UXO Technician II	115 / 5.5	7	0	7	0
UXO Technician I	115 / 5.4	36	14	0	22
UXO Technician I	6204-113	4	0	0	4
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	6204-113	4	0	0	4
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	20	20	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.4	10	2	0	8
Wil Chee Planning	115 / 5.5	24	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
		0	0	0	0

a. Daily Equipment:

Description:	Task:	No. of Units	Hours Used	Remarks:
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	130	
White's Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	3	26	
Trimble ProXRT GPS	6204-113	1	4	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	
Laptop Computer	6210-115	2	26	
Printer	6210-115	1	11	

5. Operational Remarks:

Additional personnel on site were Alan Crandall and Richard McNeil from USAE to conduct EM-61 MK 2 Digital Geophysical Mapping (DGM) operations. Also on site were Edgar Pajarillo, Cheng Fan Wang, and Albert Grande from Control Point Survey (CPS) to survey in all Grids, AOC Boundaries and the DGM Intrusive Transect. All these personnel were given Site Specific Safety and appropriate Activity Hazard Analysis Briefs prior to entering the Exclusion Zone (EZ).

Clayton Sugimoto, Deena Kam, and Heip Nguyen from Wil Chee Planning along with one project field archeologist, and escorted by UXO Technician II Cory Sullenburger, completed the collection of sub-surface (SS) soil samples borings at depths of 2 feet bgs and 3 feet bgs from within the surface cleared areas of the Decision Units (DUs) located within AOC1, AOC2, and AOC3. For SS sampling operations AOC1 consisted of one (DU1), AOC2 consisted of three DUs (DU2, DU3, and DU4), and AOC3 also consisted of three DUs (DU5, DU6, and DU7). A total of 14 primary Discreet SS soil samples and 1 Quality Control Duplicate SS soil sample were collected during the day's soil sample collection operations. Two samples, one at 2 foot bgs and one at 3 foot bgs were collected at a random single location from each of the DUs. SS sample ID numbers in AOC1 were WVIA-SS-001, and WVIA-SS-002 collected from DU1. Soil sample ID numbers in AOC2 were WVIA-SS-003 and WVIA-SS-004 collected from DU4, soil sample ID numbers WVIA-SS-005 and WVIA-SS-006 collected from DU3, and soil sample ID numbers WVIA-SS-007 and WVIA-SS-008 collected from DU2. Soil sample ID numbers in AOC3 were WVIA-SS-009 and WVIA-SS-010 collected from DU5, soil sample ID numbers WVIA-SS-011, WVIA-SS-012 and WVIA-SS-013 (QC Duplicate Sample) collected from DU6, and soil sample ID numbers WVIA-SS-014 and WVIA-SS-015 collected from DU7.

The project UXO Quality Control Assistant conducted and completed the re-acquisition and item confirmation of three MEC (UXO) items that were identified during the 2008 SI Reconnaissance. One of the three items re-acquired was investigated and confirmed as a practice munitions items, the other two locations were confirmed to have been cleared during surface clearance operations by the MEC Teams. A GPS waypoint was collected at each of the re-acquisition locations, and a detailed description of the item was noted in the digital project MEC accountability log.

The project UXO Quality Control Assistant along with one project UXO Technician I conducted and completed a characterization reconnaissance north of the northern idealized boundary of AOC3 in order to determine the horizontal extent of munitions concentration items in that area and to better characterize the munitions contamination boundary. GPS waypoints were collected of the horizontal extent of munitions, and detailed descriptions of the characterization were logged in the digital project MEC accountability log. During the characterization a 3.5-inch rocket was located approximately 20 meters north from the northeast corner of AOC3. A GPS waypoint was collected and a detailed description of the item was noted in the digital project MEC accountability log.

The RI field team completed intrusive operations in the remaining two grids established within the boundaries of AOC 3. The following grids were completed with results as listed below:

GRID ID #	# OF DIGS	UXO/MPPEH	MD (IN LBs).	MAJOR MD ITEMS
AOC3-7	15	NONE	0	No MD recovered in this Grid.
AOC3-3	80	NONE	135	Several large fragments from 2.36" and 3.5" rockets.

Additionally, the RI field team established and removed vegetation in 4 grids in AOC 2 as follows:

GRID	LOCATION
AOC2-1	Southeast
AOC2-2	South central
AOC2-3	Southwest
AOC2-5	Northeast

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQC conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. **Signatures / Date:**

___________David Wilson_____________ **Date:** 4/26/2010
SUXOS

___________Daniel Miller____ _______ **Date:** 4/26/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 4/27/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:

Work Accomplished	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	0 acres	0.47 acres
(b) AOC2 (7.9 acres)	0 acres	3.49 acres
(c) AOC3 (8.4 acres)	0 acres	5.70 acres
(d) AOC4 (5.1 acres)	0 acres	1.35 acres
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2 (8 grids)	2	2
(c) AOC3 (8 grids)	2	8
(d) AOC4 (6 grids)	0	6
(3) Sediment Samples	0	03 Composite
(4) Multi-Incremental Samples	0	30 MIS
(5) Subsurface Samples	3	20 Discreet
(6) Blow-In-Place Samples	0	10 Discreet

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Complete grid establishment and vegetation cutting/grubbing operations within the surface cleared area of AOC2. Commence sub-surface investigation operations in the established grids within the surface cleared area AOC2. Complete sub-surface soil sampling boring collection in AOC4. Continue survey of grids established in AOC3 and AOC4. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan. Commence EM-61 MK 2 Digital Geophysical Mapping (DGM) of established grids in AOC4.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during intrusive operations within AOC2.	Various Pieces	. 25 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	10	10	0	0
SUXOS	115 / 5.2	11.5	3.5	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	17	4	8	5
UXO Technician II	115 / 5.5	3	0	3	0
UXO Technician I	115 / 5.4	37	16	0	21
UXO Technician I	6204-113	3	0	0	3
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	7	2	0	5
UXO Technician II	6204-113	3	0	0	3
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	20	20	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.4	10	2	8	0
Wil Chee Planning	115 / 5.5	12	0	0	0
CH2M Hill	115 / 5.3	8	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
		0	0	0	0

a. Daily Equipment:

Description:	Task:	No. of Units	Hours Used	Remarks:
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	130	
White’s Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	3	27	
Trimble ProXRT GPS	6204-113	1	3	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	
Laptop Computer	6210-115	2	22	
Printer	6210-115	1	11	

5. Operational Remarks:

Additional personnel on site were Alan Crandall and Richard McNeil from USAE to continue with EM-61 MK 2 Digital Geophysical Mapping (DGM) operations. Also on site were Edgar Pajarillo, Cheng Fan Wang, Albert Grande, and Michael Pajarillo from Control Point Survey (CPS) to continue surveying in all Grids, AOC Boundaries and the DGM Intrusive Transect, and Kan Lui and Sergio Cocchia from CH2M Hill. Michael Pajarillo and Sergio Cocchia were given Site Specific Safety and appropriate Activity Hazard Analysis Briefs prior to entering the Exclusion Zone (EZ).

Clayton Sugimoto, Deena Kam, and Heip Nguyen from Wil Chee Planning, along with Kan Lui and Sergio Cocchia from CH2M Hill, and one project field archeologist, all escorted by UXO Technician II Cory Sullenburger, completed the collection of sub-surface (SS) soil samples borings at depths of 2 feet bgs and 3 feet bgs from within the surface cleared areas of the Decision Units (DUs) located within AOC4. For SS sampling operations AOC4 consisted of three DUs (DU8, DU9, and DU10). A total of 6 primary Discreet SS soil samples, 1 Quality Control Duplicate SS soil sample, 1 Matrix Spike MS soil sample, 1 Matrix Spike Duplicate MSD soil sample, and 1 background soil sample were collected during the day's soil sample collection operations. Two samples, one at 2 foot bgs and one at 3 foot bgs were collected at a random single location from each of the DUs. Soil sample ID numbers WVIA-SS-016, WVIA-SS-017, soil samples ID number WVIA-SS-018 (Matrix Spike MS at 2foor bgs), soil sample ID number WVIA-SS-19 (Matrix Spike MSD at 2 foot bgs) were collected at DU8, soil sample ID number WVIA-SS-020 and WVIA-SS-021 were collected at DU9, and soil sample ID numbers WVIA-SS-022, WVIA-SS-023, and WVIA-SS-024 (QC Duplicate Sample) were collected from DU10. Additionally, soil sample ID number WVIA-SS-025 (Background) was collected at the entrance gate to the WVIA access road.

The project UXO Quality Control Assistant conducted and completed a characterization reconnaissance north of the northern idealized boundary of AOC2 in order to determine the horizontal extent of munitions concentration items in that area and to better characterize the munitions contamination boundary. GPS waypoints were collected of the horizontal extent of munitions, and detailed descriptions of the characterization were logged in the digital project.

The RI field team established and removed vegetation in 4 grids in AOC 2 as follows:

GRID	**LOCATION**
AOC2-4	Northeast area of AOC2
AOC2-6	North/Northwest area of AOC2
AOC2-7	Along the Central Western Boundary of AOC2
AOC2-8	Western Central area of AOC2

Additionally, the RI field team completed intrusive operations in one grid established within the boundaries of AOC 2. The following grids were completed with results as listed below:

GRID ID #	# OF DIGS	UXO/MPPEH	MD (IN LBs).	MAJOR MD ITEMS
AOC2-1	41	NONE	25	Several parts and pieces from 3.5" rockets.

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQC conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. Signatures / Date:

David Wilson
SUXOS
Date: 4/27/2010

Daniel Miller
Site Manager
Date: 4/27/2010

DAILY OPERATIONS SUMMARY

DATE: Wednesday, 4/28/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:

	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	0 acres	0.47 acres
(b) AOC2 (7.9 acres)	0 acres	3.49 acres
(c) AOC3 (8.4 acres)	0 acres	5.70 acres
(d) AOC4 (5.1 acres)	0 acres	1.35 acres
(2) Subsurface Investigation		
(a) AOC1	0	0
(b) AOC2 (8 grids)	6	8
(c) AOC3 (8 grids)	2	8
(d) AOC4 (6 grids)	0	6
(3) Sediment Samples	0	03 Composite
(4) Multi-Incremental Samples	0	30 MIS
(5) Subsurface Samples	0	20 Discreet
(6) Blow-In-Place Samples	0	10 Discreet

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Continue sub-surface investigation operations in the established grids within the surface cleared area AOC2. Continue survey of grids established in AOC4 and AOC3. Continue EM-61 MK 2 Digital Geophysical Mapping (DGM) of established grids in AOC4 and AOC3. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located: No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended: No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during intrusive operations within AOC2.	Various Pieces	. 58 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	16	16	0	0
SUXOS	115 / 5.2	12	4	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	20	4	8	8
UXO Technician II	115 / 5.5	0	0		0
UXO Technician I	115 / 5.4	40	8	0	32
UXO Technician I	6204-113	0	0	0	0
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	8	2	0	8
UXO Technician II	6204-113	0	0	0	0
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	20	20	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech II	115 / 5.4	10	2	8	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
		0	0	0	0

a. Daily Equipment:

Description:	Task:	No. of Units	Hours Used	Remarks:
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	130	
White's Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	3	30	
Trimble ProXRT GPS	6204-113	0	0	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	
Laptop Computer	6210-115	2	27	
Printer	6210-115	1	15	

5. Operational Remarks:

Additional personnel on site were Alan Crandall and Richard McNeil from USAE to continue with EM-61 MK 2 Digital Geophysical Mapping (DGM) operations. Also on site were Edgar Pajarillo, Cheng Fan Wang, Albert Grande, and Michael Pajarillo from Control Point Survey (CPS) to continue surveying in all Grids, AOC Boundaries and the DGM Intrusive Transect.

The Control Point Survey crew, escorted by UXO Technician II John Keene, used a Total Station and collected pointed in all 4 corners of the 6 grids in AOC4. Additionally, they placed stakes in all 4 corners of the 8 grids in AOC3 and will collect these points on Thursday, 29 April.

The EM-61 MK 2 crew, escorted by UXO Technician II Mike Donaldson, completed DGM operations in grids AOC4-6, AOC3-7, and AOC3-6.

The RI field team completed intrusive operations in the 7 remaining grids within the boundaries of AOC 2. The following grids were completed with results as listed below:

GRID ID #	# OF DIGS	UXO/MPPEH	MD (IN LBs).	MAJOR MD ITEMS
AOC2-2	39	NONE	40	Several large fragments from 3.5" rockets.
AOC2-4	14	NONE	10	Several large fragments from 3.5" rockets.
AOC2-5	2	NONE	2	1 ea. Piece of a 75MM Projectile.
AOC2-6	5	NONE	None	NONE
AOC2-3	12	NONE	3	1 ea. large fragment from 3.5" rocket.
AOC2-7	2	NONE	1	1 ea. large fragment from 3.5" rocket.
AOC2-8	1	NONE	None	NONE

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQC conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. Signatures / Date:

___________David Wilson______________ **Date:** 4/28/2010
SUXOS

___________Daniel Miller___________ **Date:** 4/28/2010
Site Manager

DAILY OPERATIONS SUMMARY

DATE: Thursday, 4/29/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:

Work Accomplished	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**0.47 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.49 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.70 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.35 acres**
(2) Subsurface Investigation		
(a) AOC1 (3 grids)	**3**	**3**
(b) AOC2 (8 grids)	**6**	**8**
(c) AOC3 (8 grids)	**2**	**8**
(d) AOC4 (6 grids)	**0**	**6**
(3) Sediment Samples	**0**	**03 Composite**
(4) Multi-Incremental Samples	**0**	**30 MIS**
(5) Subsurface Samples	**0**	**20 Discreet**
(6) Blow-In-Place Samples	**0**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue remedial investigation operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Commence and complete grid establishment and vegetation removal/grubbing and sub-surface investigation operations within the surface cleared area AOC1. Continue survey of grids established in AOC3. Continue EM-61 MK 2 Digital Geophysical Mapping (DGM) of established grids in AOC2. Conduct and complete explosive blow-in-place (BIP) and consolidation disposal operations on all remaining UXO and MPPEH items. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. Demolition Supplies Expended:

Type:	Quantity:	Remarks:
Cap, Blasting, Electric, No Delay	6 Each	
Perforator, RDX Shape Charge, 19.5 gram	5 Each	
Cord, Detonating, 80 grain	95 Feet	

c. MD/Scrap Generation/Disposition:

Type:	Quantity:	Weight:	Remarks:
Various Munitions Debris Items recovered during explosive disposal operations east and west of AOC2, and within the boundaries of AOC4.	Various Pieces	. 45 Lbs.	All MD was inspected for energetic material, and consolidated within the AOC until disposition at a later date.
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
Site Manager	115 / 5.2	16	16	0	0
SUXOS	115 / 5.2	12	4	0	8
UXO Technician III	115 / 5.4	20	6	0	14
UXO Technician II	115 / 5.4	4	4	0	0
UXO Technician II	115 / 5.5	16	0	16	0
UXO Technician I	115 / 5.4	40	8	0	32
UXO Technician I	6204-113	0	0	0	0
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	8	2	0	8
UXO Technician II	6204-113	0	0	0	0
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	20	20	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech III	115 / 5.4	10	2	8	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
		0	0	0	0

a. Daily Equipment:

Description:	Task:	No. of Units	Hours Used	Remarks:
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	130	
White's Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	3	30	
Trimble ProXRT GPS	6204-113	0	0	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	
Laptop Computer	6210-115	2	27	
Printer	6210-115	1	15	

5. Operational Remarks:

Additional personnel on site were Alan Crandall and Richard McNeil from USAE to continue with EM-61 MK 2 Digital Geophysical Mapping (DGM) operations. Also on site were Edgar Pajarillo, Cheng Fan Wang, Albert Grande, and Michael Pajarillo from Control Point Survey (CPS) to continue surveying in all grids, AOC Boundaries and the DGM Intrusive Transect.

The Control Point Survey crew, escorted by UXO Technician II John Keene, used a Total Station and collected pointed in all 4 corners of the remaining 6 grids to be surveyed in AOC2.

The EM-61 MK 2 crew, escorted by UXO Technician II Cory Sullenberger, completed DGM operations in grid AOC3-8. DGM equipment was then moved to the northern section of AOC2 prior to explosive disposal operations. Upon completion of explosive disposal operations, the Team checked the remaining grids in AOC2 to ascertain if any may be able to be digitally mapped.

The RI field team completed grid establishment, vegetation removal/grubbing, and intrusive operations in AOC 1. The following grids were completed with results as listed below:

GRID ID #	LOCATION	# OF DIGS	UXO/MPPEH	MD (IN LBs).	MAJOR MD ITEMS
AOC1-1	North	1	NONE	0	NONE
AOC1-2	Center	5	NONE	0	Small arms (ball).
AOC1-3	South	2	NONE	2	Small arms (ball).

Additionally, the RI field team conducted explosive disposal demolition operations at the Former Waikane Valley Impact Area project site.

A total of three separate explosive demolition disposal shots were conducted. Two disposal shots were outside the surface swept areas and one disposal shot was within the surface swept area of AOC4. The SUXOS divided the UXO Teams into three separate Demolition Teams for the day's operations.

Demolition Team 1 was responsible for explosive disposal operations within AOC4 where one separate explosive demolition shot was conducted. The explosive demolition disposal shot was in the southwestern area in AOC4 and consisted of a single M28 HEAT Rifle Grenade. The UXO item was confirmed to contain high explosives.

Demolition Team 2 was responsible for explosive disposal operations above the northeast corner of the surface swept area of AOC3. A single consolidated explosive demolition shot was conducted consisting of one 3.5- rocket and one 2.36-inch rocket motor with fuze and detonator attached. The 2.36-inch rocket motor was moved from where it had been located in grid AOC3-4. The UXO item (3.5-inch rocket) and the MPPEH item (2.36-inch rocket motor) were confirmed as contain high explosives.

Demolition Team 3 was responsible for explosive disposal operations between the northern areas of AOC2 and AOC3. A single consolidated explosive demolition shot was conducted consisting of one MEC (UXO) item identified as 2.36-inch HEAT rocket warhead with fuze attached, a remnant of the 60MM HE mortar disposed of on 4-15-2010 (possible MPPEH), and three large base sections of 75MM projectiles. These 75MM projectile bases were located earlier on in the project and had been consolidated and marked for later inspection to allow the soil within the base sections to dry, hoping it would allow hand removal to verify these items were free of energetic material. The soil remained unable to be removed manually, and knotted detonating cord was placed in each item to remove the soil. The UXO item (2.36-inch rocket warhead) was confirmed to contain high explosives, and all other items were Munitions Debris (MD).

For a specific list of all MEC (UXO) and MPPEH items disposed of today by explosive detonation refer to the Attachment 5 of the MEC SAP SOP 6, Explosive Disposal Log (attached).

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQC conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. Signatures / Date:

___________David Wilson______________ **Date:** 4/29/2010
SUXOS

___________Daniel Miller______________ **Date:** 4/29/2010
Site Manager

Field Daily Reports

May 2010

DAILY OPERATIONS SUMMARY

DATE: Monday, 5/03/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**0.47 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.49 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.70 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.35 acres**
(2) Subsurface Investigation		
(a) AOC1 (3 grids)	**0**	**3**
(b) AOC2 (8 grids)	**0**	**8**
(c) AOC3 (8 grids)	**0**	**8**
(d) AOC4 (6 grids)	**0**	**6**
(3) Sediment Samples	**0**	**03 Composite**
(4) Multi-Incremental Samples	**0**	**30 MIS**
(5) Subsurface Samples	**0**	**20 Discreet**
(6) Blow-In-Place Samples	**0**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Complete survey of grids established in AOC2. Commence brush cutting of AOC 5 transect areas. Continue EM-61 MK 2 Digital Geophysical Mapping (DGM) of established grids in AOC2 and AOC 5 transect areas. Commence consolidation of all Munitions Debris MD (in AOC#2, AOC#3, and AOC#4) for removal by helicopter. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. **Demolition Supplies Expended:** No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition: No MD/scrap generated this day.

Type:	Quantity:	Weight:	Remarks:
		.	
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
SUXOS	115 / 5.2	12	4	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	10	2	0	8

UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.4	40	8	0	32
UXO Technician I	6204-113	0	0	0	0
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	6204-113	0	0	0	0
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	20	20	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech III	115 / 5.4	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
		0	0	0	0

a. **Daily Equipment:**

Description:	**Task:**	**No. of Units**	**Hours Used**	**Remarks:**
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	130	
White's Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	3	30	
Trimble ProXRT GPS	6204-113	0	0	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	
Laptop Computer	6210-115	1	12	
Printer	6210-115	1	10	

5. Operational Remarks:

Mobilized in Brian Thompson, UXO Technician II. The UXOSO briefed Thompson on the Site Specific Safety Plan and appropriate Activity Hazard Analysis Briefs prior to entering the Exclusion Zone (EZ).

Additional personnel on site were Alan Crandall and Richard McNeil from USAE to continue with EM-61 MK 2 Digital Geophysical Mapping (DGM) operations. Also on site were Edgar Pajarillo, Cheng Fan Wang, Albert Grande, and Michael Pajarillo from Control Point Survey (CPS) to continue surveying in grids located in AOC 2, AOC 1, the DGM Intrusive Transect, and the Instrument Test Strip (ITS).

The UXOSO, UXO Technician II Brian Thompson, and UXO Technician I Jayson DeHerrera completed brush cutting operations in the AOC 5 transect area. Five transects were established as follows:

South of AOC 4	82-feet long X 4-feet wide
South of AOC 3	42-feet long X 4-feet wide
South of AOC 2	50-feet long X 4-feet wide
South of AOC 2	72-feet long X 4-feet wide
South of AOC 2	50-feet long X 4-feet wide

The Control Point Survey crew, escorted by UXO Technician III Seth Alu, placed survey stakes in all 4 corners of the eight grids in AOC 2. The crew also established line of site transects between all grids to be surveyed in AOC2. Additionally, the crew surveyed in the four corners of the Instrument Test Strip (ITS).

The EM-61 MK 2 crew, escorted by UXO Technician II (UXOQC Assistant) Robert Rice, completed DGM operations in grids AOC2-5 and AOC2-6. Additionally they completed all five AOC 5 transects.

The RI field team completed consolidating all MD within three AOCs (there was no MD consolidation point in AOC 1). There are 3 MD consolidation points in AOC 3, a single MD consolidation point in AOC 4, and another single MD consolidation point in AOC 2. GPS waypoints were taken for all five MD consolidation points and will be e-mailed to the Oldsmar office to be plotted on maps and converted to latitude and longitude for the MD removal by helicopter.

The SUXOS contacted Pacific Helicopter and confirmed that helicopter support is scheduled from 0830-1130 on Wednesday 5 May, Thursday 6 May, and if needed Friday 7 May.

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS, Site Manager and UXOQC conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. Signatures / Date:

__________David Wilson______________ **Date:** 5/03/2010

SUXOS

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 5/04/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	0 acres	0.47 acres
(b) AOC2 (7.9 acres)	0 acres	3.49 acres
(c) AOC3 (8.4 acres)	0 acres	5.70 acres
(d) AOC4 (5.1 acres)	0 acres	1.35 acres
(2) Subsurface Investigation		
(a) AOC1 (3 grids)	0	3
(b) AOC2 (8 grids)	0	8
(c) AOC3 (8 grids)	0	8
(d) AOC4 (6 grids)	0	6
(e) AOC 5 transects (5)	5	5
(3) Sediment Samples	0	03 Composite
(4) Multi-Incremental Samples	0	30 MIS
(5) Subsurface Samples	0	20 Discreet
(6) Blow-In-Place Samples	0	10 Discreet

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Continue operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Complete survey of grids established in AOC2. Complete cutting brush in the AOC 5 transect areas and complete intrusive investigation of picked targets. Conduct small tree removal in AOC 3 to facilitate helicopter extraction of Munitions Debris (MD). Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. MEC (UXO)/MPPEH Located: No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. **Demolition Supplies Expended:** No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. **MD/Scrap Generation/Disposition:** No MD/scrap generated this day.

Type:	Quantity:	Weight:	Remarks:
		.	
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
SUXOS	115 / 5.2	8	2	0	6
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0

UXO Technician I	115 / 5.4	40	8	0	32
UXO Technician I	6204-113	0	0	0	0
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	10	2	0	8
UXO Technician II	6204-113	0	0	0	0
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	20	20	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech III	115 / 5.4	10	2	0	8
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0
		0	0	0	0

a. Daily Equipment:

Description:	**Task:**	**No. of Units**	**Hours Used**	**Remarks:**
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Schonstedt	6210-115	13	130	
White's Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	3	30	
Trimble ProXRT GPS	6204-113	0	0	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	
Laptop Computer	6210-115	1	10	
Printer	6210-115	1	10	

5. Operational Remarks:

Additional personnel on site were Alan Crandall and Richard McNeil from USAE to continue with EM-61 MK 2 Digital Geophysical Mapping (DGM) operations. Also on site were Edgar Pajarillo, Cheng Fan Wang, Albert Grande, and Michael Pajarillo from Control Point Survey (CPS) to continue surveying in grids located in AOC 2, AOC 1, the DGM Intrusive Transect, and the Instrument Test Strip (ITS).

The Control Point Survey crew, escorted by UXO Technician III Seth Alu, used a Total Station, and surveyed in all 4 corners of the six grids in AOC 2 (AOC2-1 through AOC2-6). Additionally, they surveyed in the eastern and western boundaries and centerlines of the five AOC 5 transects.

The EM-61 MK 2 crew provided target data for the five AOC transects. The UXOQC Assistant (Robert Rice) and UXO Technician I Cameron Black investigated these targets with results as follows:

GRID ID #	TARGET ID#	ITEM
AOC5-1	T-1	Surveyor Hub
	T-2	Control Seed
	T-3	QC Seed
AOC5-2	NO TARGETS	
AOC5-3	T-1	Control Seed
	T-2	QC Seed
AOC5-4	T-1	Control Seed
	T-2	QC Seed

The RI field team cut several small trees down (less than 6-inches in diameter) and further cut them into 2-foot sections. The trees were in the northern MD consolidation point in AOC 3. The tree removal was required to facilitate the extraction of the MD by helicopter. The team also removed fluffing tape and pin flags from AOC 3 and AOC 4.

The SUXOS contacted the Pacific Helicopter pilot who will be flying on Wednesday, 5 May to discuss operations. Pacific Helicopter will provide two VHF radios which will allow USAE personnel and at both the extraction point and drop off point to maintain communications with the pilot.

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS and UXOQC conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations was secured.

6. Signatures / Date:

__________David Wilson______________ **Date:** 5/04/2010

SUXOS

DAILY OPERATIONS SUMMARY

DATE: Wednesday, 5/05/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:

Work Accomplished	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	0 acres	0.47 acres
(b) AOC2 (7.9 acres)	0 acres	3.49 acres
(c) AOC3 (8.4 acres)	0 acres	5.70 acres
(d) AOC4 (5.1 acres)	0 acres	1.35 acres
(2) Subsurface Investigation		
(a) AOC1 (3 grids)	0	3
(b) AOC2 (8 grids)	0	8
(c) AOC3 (8 grids)	0	8
(d) AOC4 (6 grids)	0	6
(e) AOC 5 transects (5)	5	5
(3) Sediment Samples	0	03 Composite
(4) Multi-Incremental Samples	0	30 MIS
(5) Subsurface Samples	1*	21 Discreet
* Second background sample		
(6) Blow-In-Place Samples	0	10 Discreet

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Complete survey of grids established in AOC2 and AOC 1. Conduct helicopter extraction of Munitions Debris (MD) in MD consolidation point #2 in AOC 3. Complete background soil sample. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. **Demolition Supplies Expended:** No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition: No MD/scrap generated this day.

Type:	Quantity:	Weight:	Remarks:
		.	
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
SUXOS	115 / 5.2	12	4	0	8
UXO Technician III	115 / 5.4	20	4	0	16
UXO Technician II	115 / 5.4	10	2	0	8
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.4	40	8	0	28
UXO Technician I	6204-113	0	0	0	4
UXOSO	115 / 5.2	10	2	0	8
UXOQCS	115 / 5.2	10	2	0	8
UXO Technician II	115 / 5.2	6	2	0	0
UXO Technician II	6204-113	0	0	0	4
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech III	115 / 5.4	10	2	0	8
Wil Chee Planning	115 / 5.5	4	4	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	4	4	0	0

a. Daily Equipment:

Description:	Task:	No. of Units	Hours Used	Remarks:
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Truck, Stake with power lift	6210-115	1	10	
Schonstedt	6210-115	13	130	
White's Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	2	20	
Trimble ProXRT GPS	6204-113	1	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	e
Laptop Computer	6210-115	1	10	
Printer	6210-115	1	10	

5. Operational Remarks:

Additional personnel on site today were Edgar Pajarillo, Cheng Fan Wang, Albert Grande, and Michael Pajarillo from Control Point Survey (CPS) and Clayton Sigamoto from Wil Chee Planning.

The UXOSO and Team Leader 1 picked up a stake truck with a hydraulic powered lift platform from United Truck Rental which had been reserved by the SUXOS on Friday, 2 April. They then proceeded to the storage area where five 55-gallon drums were picked up. The stake truck was then driven to the Waikane Valley Impact Area and parked at the previously designated Munitions Debris (MD) drop off point on a side road approximately 100 yards inside the access gate.

The Control Point Survey crew, escorted by UXO Technician III Seth Alu, surveyed in all 4 corners of the remaining 2 grids in AOC 2, and all 4 corners of the 3 grids in AOC 1.

Clayton Sigamoto from Wil Chee planning, escorted by the UXOQC Assistant Robert Rice, retrieved a background soil sample northeast of the eastern fence line of the Impact Area at approximately the 600-foot elevation level. The soil sample ID number is WVIA-SS-026.

After completion of escorting for soil sample collection, the UXOQC Assistant and UXO Tech I Jon Black used a GPS and proceeded to take waypoints along the southern border of the entire Impact Area, identifying the areas with a greater-than-30-degree slope.

Pacific Helicopter arrived on site and landed in the designated helicopter emergency landing area. Two VHF radios set to the aircraft frequency were provided to the UXOSO (who was controlling the MD drop off point) and Team Leader 1 (who was controlling the extraction point in AOC 3). The pilot, SUXOS, UXOSO, and Team 1 Team Leader discussed how the operation would be conducted, including radio procedures and emergency procedures. This discussion was followed by a Tailgate Safety Brief to all personnel. The Extraction Team (1 UXO Technician III and 2 UXO Technician Is) then departed for MD consolidation point #2 in AOC 3 and the remainder of the personnel departed for the MD drop off point. Five extraction lifts were conducted, removing approximately 3,200-pounds of MD. The SUXOS and UXOQC inspected all MD which was them placed in 55-gallon drums. The drum covers were then attached, lead seals placed over the drum cover clamp ring, and seal serial numbers logged by both the SUXOS and UXOQC. A total of five (5) drums were filled.

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS and UXOQC conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations and the sealed 55-gallon drums containing the day's MD removal effort was secured.

6. Signatures / Date:

__________David Wilson______________ **Date:** 5/05/2010

SUXOS

DAILY OPERATIONS SUMMARY

DATE: Thursday, 5/06/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	Completed	Cumulative
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	0 acres	0.47 acres
(b) AOC2 (7.9 acres)	0 acres	3.49 acres
(c) AOC3 (8.4 acres)	0 acres	5.70 acres
(d) AOC4 (5.1 acres)	0 acres	1.35 acres
(2) Subsurface Investigation		
(a) AOC1 (3 grids)	0	3
(b) AOC2 (8 grids)	0	8
(c) AOC3 (8 grids)	0	8
(d) AOC4 (6 grids)	0	6
(e) AOC 5 transects (5)	5	5
(3) Sediment Samples	0	03 Composite
(4) Multi-Incremental Samples	0	30 MIS
(5) Subsurface Samples	0	21 Discreet
(6) Blow-In-Place Samples	0	10 Discreet

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue operations at the MCBH Waikane Valley Impact Area per the project Work Plan. Complete survey of grids established in AOC4. Complete helicopter extraction of Munitions Debris (MD) in MD consolidation point #2 in AOC 2, AOC 3, and AOC 4. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. **Demolition Supplies Expended:** No demolition supplies expended this day.

Type:	**Quantity:**	**Remarks:**

c. MD/Scrap Generation/Disposition: No MD/scrap generated this day.

Type:	**Quantity:**	**Weight:**	**Remarks:**
		.	
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
SUXOS	115 / 5.2	15	7	0	8
UXO Technician III	115 / 5.4	22	4	0	18
UXO Technician II	115 / 5.4	11	2	0	9
UXO Technician II	115 / 5.5	0	0	0	0
UXO Technician I	115 / 5.4	44	8	0	32
UXO Technician I	6204-113	0	0	0	4
UXOSO/UXOQCS	115 / 5.2	11	2	0	9
UXO Technician II	115 / 5.2	6	2	0	0
UXO Technician II	6204-113	0	0	0	4
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech III	115 / 5.4	11	2	0	9
Wil Chee Planning	115 / 5.5	4	4	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	4	4	0	0

a. Daily Equipment:

Description:	Task:	No. of Units	Hours Used	Remarks:
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Truck, Stake with power lift	6210-115	1	10	
Schonstedt	6210-115	13	130	
White's Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	2	20	
Trimble ProXRT GPS	6204-113	1	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	
Laptop Computer	6210-115	1	10	
Printer	6210-115	1	10	

5. Operational Remarks:

Additional personnel on site today were Edgar Pajarillo, Cheng Fan Wang, Albert Grande, and Michael Pajarillo from Control Point Survey (CPS) and Lance Higa, Richard Hosokawa, and Michael Robinson from Naval Facilities Engineering command Pacific.

The Control Point Survey crew, escorted by UXO Technician III Seth Alu, surveyed in all 4 corners of the 6 grids in AOC 4. All surveying is complete to include all 25 grids in the AOCs (AOC1=3, AOC2=8, AOC3=6, and AOC4=6), the five transects in AOC5, and the Instrument Test Strip (ITS).

The UXOQC Assistant and UXO Tech I Jon Black used a GPS and proceeded to take waypoints along the northern border of the entire Impact Area, identifying the areas with a greater-than-30-degree slope.

Pacific Helicopter arrived on site and landed in the designated helicopter emergency landing area. Two VHF radios set to the aircraft frequency were provided to the UXOSO (who was controlling the MD drop off point) and Team Leader 1 (who was controlling the extraction point in AOC 3). The pilot, SUXOS, UXOSO, and Team 1 Team Leader discussed how the operation would be conducted, including radio procedures and emergency procedures. This discussion was followed by a Tailgate Safety Brief to all personnel. Three Extraction Teams (AOC 2, AOC 3, and AOC 4) then departed for their assigned MD consolidation points and the remainder of the personnel departed for the MD drop off point. Seven extraction lifts were conducted, removing approximately 4,200-pounds of MD. The SUXOS and UXOQC inspected all MD which was them placed in 55-gallon drums. The drum covers were then attached, lead seals placed over the drum cover clamp ring, and seal serial numbers logged by both the SUXOS and UXOQC. A total of ten (10) drums were filled. Counting drums filled on 5-05-2010 and 5-06-2010, a total of fifteen (15) drums are filled with MD.

At the end of the day's field operations, all personnel returned to the staging area where the SUXOS and UXOQC conducted a debriefing of the day's operations. All personnel proceeded to the self-storage rental unit where the equipment from the day's operations and the sealed 55-gallon drums containing the day's MD removal effort was secured.

6. Signatures / Date:

___________David Wilson_____________ **Date:** 5/06/2010

SUXOS

DAILY OPERATIONS SUMMARY

DATE: Monday, 5/10/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**0.47 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.49 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.70 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.35 acres**
(2) Subsurface Investigation		
(a) AOC1 (3 grids)	**0**	**3**
(b) AOC2 (8 grids)	**0**	**8**
(c) AOC3 (8 grids)	**0**	**8**
(d) AOC4 (6 grids)	**0**	**6**
(e) AOC 5 transects (5)	**5**	**5**
(3) Sediment Samples	**0**	**03 Composite**
(4) Multi-Incremental Samples	**0**	**30 MIS**
(5) Subsurface Samples	**0**	**21 Discreet**
(6) Blow-In-Place Samples	**0**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Complete collecting waypoints along the entire east/west southern boundary of the WVIA identifying areas with a greater than 30 degree slope. Complete cleaning, packing, and shipping USAE owned equipment. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. **Demolition Supplies Expended:** No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition: No MD/scrap generated this day.

Type:	Quantity:	Weight:	Remarks:
		.	
		.	

4. Utilization

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
SUXOS	115 / 5.2	12	10	0	0
UXO Technician III	115 / 5.4	20	20	0	0
UXO Technician II	115 / 5.4	10	10	0	0
UXO Technician I	115 / 5.4	40	40	0	0
UXO Technician I	6204-113	12	2	0	10
UXOSO/UXOQCS	115 / 5.2	12	2	0	0
UXO Technician II	6204-113	0	0	0	10
EMT	115 / 5.2	10	10	0	0
Geophysicist	115 / 5.4	0	0	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech III	115 / 5.4	10	10	0	0
Wil Chee Planning	115 / 5.5	0	0	0	0
CH2M Hill	115 / 5.3	0	0	0	0
Pacific Helicopter	115 / 5.3	0	0	0	0

a. Daily Equipment:

Description:	Task:	No. of Units	Hours Used	Remarks:
SUV Vehicle 4WD	6210-115	5	50	
Truck, Crew Cab 4WD	6210-115	1	10	
Truck, Pick-up 4WD	6210-115	1	10	DEIs Truck
Truck, Stake with power lift	6210-115	1	10	
Schonstedt	6210-115	13	130	
White's Detector	6210-115	5	50	
Trimble ProXRT GPS	6210-115	2	20	
Trimble ProXRT GPS	6204-113	1	10	
Remote Firing Device	6210-115	1	10	
Brush Cutter	6210-115	2	20	
Chain Saw	6210-115	2	20	
Self Storage Rental Unit	6210-115	1	10	
Cell Phone	6210-115	1	11	
Office Desk/Chair	6210-115	1	14	
Digital Camera	6210-115	4	40	
Hand Held Radio	6210-115	9	90	
EMT Medical Gear	6210-115	1	10	
Team Safety Equipment	6210-115	2	20	
Team Operating Equipment	6210-115	2	20	
Laptop Computer	6210-115	1	12	
Printer	6210-115	1	12	

5. Operational Remarks:

The UXOQC (Randy Jenkins) and UXO Tech I Jon Black used a GPS and proceeded to take waypoints along the southern border of the entire Impact Area, identifying the areas with a greater-than-30-degree slope. Collect these waypoints in the area between the southern side of the stream and the northern side of the southern fence line. In order to medical support (if needed) and maintain communications between the SUXOS and the GPS team, the medic (Philbon Smith) accompanied Jenkins and Black and staging himself on the road along the southern fence line.

The remainder of the RI field team inventoried, cleaned and packed all field equipment (with the exception of two handheld radios and one GPS unit which was being used by the UXOQC) into 2 pallet containers. The containers were then delivered to the FEDEX freight office for transport to the USAE Oldsmar, FL warehouse.

At the end of the day's operations, all personnel departed for assigned housing.

6. **Signatures / Date:**

___________David Wilson_____________ **Date:** 5/10/2010
SUXOS

DAILY OPERATIONS SUMMARY

DATE: Tuesday, 5/11/2010 **PAGE 1 OF 5 PAGES**

SITE: Waikane Valley Impact Area Remedial Investigation, MCBH Kaneohe, HI

1. WORK SUMMARY

a. Work Accomplished:

Work Accomplished	**Completed**	**Cumulative**
(1) Surface Sweep		
(a) AOC1 (1.8 acres)	**0 acres**	**0.47 acres**
(b) AOC2 (7.9 acres)	**0 acres**	**3.49 acres**
(c) AOC3 (8.4 acres)	**0 acres**	**5.70 acres**
(d) AOC4 (5.1 acres)	**0 acres**	**1.35 acres**
(2) Subsurface Investigation		
(a) AOC1 (3 grids)	**0**	**3**
(b) AOC2 (8 grids)	**0**	**8**
(c) AOC3 (8 grids)	**0**	**8**
(d) AOC4 (6 grids)	**0**	**6**
(e) AOC 5 transects (5)	**0**	**5**
(3) Sediment Samples	**0**	**03 Composite**
(4) Multi-Incremental Samples	**0**	**30 MIS**
(5) Subsurface Samples	**0**	**21 Discreet**
(6) Blow-In-Place Samples	**0**	**10 Discreet**

b. QC Discrepancies: None

c. QA Discrepancies: None

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Complete cleaning, packing, and shipping of rented GeoPlane GPS units and the remainder of USAE owned equipment. Commence labeling, palletizing, and transporting to FEDEX the 55-gallon barrels containing the Munitions Debris (MD) removed from the Waikane Valley Impact Area. Conduct all operations in accordance with the approved MEC Sampling Analysis Plan.

MEC SUMMARY

a. **MEC (UXO)/MPPEH Located:** No MEC (UXO) or MPPEH located this day.

Type:	Quantity:	Live/Prac.	Remarks:

b. **Demolition Supplies Expended:** No demolition supplies expended this day.

Type:	Quantity:	Remarks:

c. MD/Scrap Generation/Disposition: No MD/scrap generated this day.

Type:	Quantity:	Weight:	Remarks:
		.	
		.	

4. **Utilization**

a. Daily Man-hours:

Labor Category:	Task # 6210-	M/H Today:	M/H 0%	M/H 4%	M/H 8%
SUXOS	115 / 5.2	10	10	0	0
UXO Technician III	115 / 5.4	16	16	0	0
UXO Technician II	115 / 5.4	8	8	0	0
UXO Technician I	115 / 5.4	32	32	0	0
UXOSO/UXOQCS	115 / 5.2	8	8	0	0
EMT	115 / 5.2	8	8	0	0
Sub-Contractor Personnel (List by Category)					
DEI / UXO Tech III	115 / 5.4	8	8	0	0

a. Daily Equipment:

Description:	Task:	No. of Units	Hours Used	Remarks:
SUV Vehicle 4WD	6210-115	3	24	
Truck, Crew Cab 4WD	6210-115	1	8	
Truck, Stake with power lift	6210-115	1	8	
Self Storage Rental Unit	6210-115	1	8	
Cell Phone	6210-115	1	10	
Laptop Computer	6210-115	1	10	
Printer	6210-115	1	10	

5. **Operational Remarks:**
6.

All RI field teams members inventoried, cleaned, packed, and shipped via FEDEX the two Geo Plane rental GPS units and all remaining USAE field equipment. Additionally, all 15 55-gallon barrels containing the Munitions Debris (MD) removed from the Waikane Valley Impact Area were properly labeled (DD Form 1348-1-Attachment 1 to Work Plan Standard Operating Procedure 7; USAE 100% Material Inspection and Release Form-Attachment 2 to Work Plan Standard Operating Procedure 7; and Non-Hazardous Waste (Container Label)-Attachment 3 to Work Plan Standard Operating Procedure 7). Due to FEDEX freight weight limitations, only 3 barrels were allowed to be shipped on a single pallet. Two pallets were prepared with the barrels banded onto the pallets then transported to the Honolulu Airport FEDEX Freight office. The weight of pallet #1 was 1,732 pounds, and pallet #2 1,655 for a total MD weight of 3,387 pounds.

At the end of the day's operations, all personnel departed for assigned housing.

7. **Signatures / Date:**

___________David Wilson_____________ **Date:** 5/11/2010

SUXOS

APPENDIX A

Field Weekly QC Reports

USA ENVIRONMENTAL, INC. **WEEKLY QUALITY CONTROL REPORT**

CONTRACT No.: N62742-05-D-1868 **Task Order NO.: 0010**

SITE: Waikane Valley Impact Area RI/FS - Kaneohe, HI. **DATE: 20 / MAR / 2010**
USAE MOBILE PHONE: 1-813-695-4389
USAE SITE OFFICE PHONE: N/A

REPORT SUBMITTED BY: DAVID HEEKS **WEEK ENDING DATE: 20 / MAR / 2010**

PROJECT SCHEDULE: MON - THU / 0630 HRS TO 1700 HRS DAILY.

INSPECTIONS CONDUCTED (See Internal Audit List):

WEEK DAY	Inspection Areas						
	QCI of Overall Site	QCI of Teams	SHI of Overall Site	SHI of Teams	QC Meeting Daily / Weekly	QCI of Administration	QCI of Instruments
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	✓	✓	✓	✓	✓	✓	✓
Tuesday	✓	✓	✓	✓	✓	✓	✓
Wednesday	✓	✓	✓	✓	✓	✓	✓
Thursday	✓	✓	✓	✓	✓	✓	✓
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

QCI = Quality Control Inspection SHI = Safety and Health Inspection
See Separate Inspection Forms for the Task Checked.

ADMINISTRATIVE: **Personnel On-Site**

WEEK DAY	USAE		Sub-Contractors		Total		Visitor	Govn't
	Assigned	Present	Assigned	Present	Assigned	Present	Present	Present
Sunday	0	0	0	0	0	0	0	0
Monday	14	14	2	2	16	16	0	2
Tuesday	14	14	2	2	16	16	0	2
Wednesday	14	14	2	2	16	16	0	2
Thursday	14	14	6	6	20	20	15	2
Friday	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0

COMMENTS:

(2) Archeologists are on site daily.

NOTICES OR NON-COMPLIANCE ISSUED:

WEEK DAY	Subject Items					Response	
	Work Plan	Safety Violation	Safety Comment	Quality Control	Other	Action Required and Date	Responsible Party Initials
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

OPERATIONS:

SITE OPERATIONS (WORKING)						
AOC #1 Surface	AOC #2 Surface	AOC #3 Surface	AOC #4 Surface	BSI Surface	BSI Sub-Surface	BSI DGM
1.8 Acres	7.9 Acres	8.4 Acres	5.1 Acres	48	32	32

QUALITY CONTROL INSPECTION (PASS / FAIL)													
AOC #1 Surface		AOC #2 Surface		AOC #3 Surface		AOC #4 Surface		BSI Surface		BSI Sub-Surface		BSI	
0	0	0	0	1.5	0	0	0	5	0	0	0	0	0

See Grid / Area Inspection Forms for Location and Additional Information to include Blind Seed Items (BSI)

PERCENTAGE COMPLETED BY OPERATIONS						
AOC #1 Surface	AOC #2 Surface	AOC #3 Surface	AOC #4 Surface	AOC's BSI Surface	BSI Sub-Surface	BSI DGM
0 %	0 %	18 %	0 %	10 %	0 %	0 %

OPERATIONAL HEAVY EQUIPMENT ON-SITE						
Dump Truck	Track-hoe	Back-hoe	Bob-Cat	Water Truck	Loader	Other
0	0	0	0	0	0	N/A

NON-OPERATIONAL HEAVY EQUIPMENT						
Dump Truck	Bulldozer	Back-hoe	Bob-Cat	Water Truck	Loader	Other
0	0	0	0	0	0	N/A

COMMENTS:

N/A

INSTRUMENTATION:

Schonstedt(s): **Assigned**

Model	Serial No.	Operational	Condition	Passed ITP	Operator
GA-52Cx	174376	Yes	Good	Yes	J. Kenne / Team #1
GA-52Cx	175685	Yes	Good	Yes	R. Martinez / Team #1
GA-52Cx	176076	Yes	Good	Yes	J. Black / Team #1
GA-52Cx	263720	Yes	Good	Yes	S. Kahakua / Team #1
GA-52Cx	177802	Yes	Good	Yes	M. Donaldson / Team #2
GA-52Cx	206568	Yes	Good	Yes	J. DeHerrera / Team #2
GA-52Cx	206574	Yes	Good	Yes	P. Hui / Team #2
GA-52Cx	177802	Yes	Good	Yes	C. Sullenberger / Team #2
GA-52Cx	177805	Yes	Good	Yes	D. Heeks / UXOQCS
GA-52Cx	206573	Yes	Good	Yes	R. Jenkins / UXOQC Asst.

Schonstedt(s): **Unserviceable**

Model	Serial No.	Operational	Condition	Passed ITP	Note
N/A					

COMMENTS:

N/A

WEEKLY EXPLOSIVES USAGE:

WEEK DAY	Explosives		Blasting caps		Tube / Cord		Other	
	Boosters	Perforators	Elect Caps	Non-Elect Caps	Non-EL	Det Cord 80 grain	Time Fuse	Other
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	1 ea.	2 ea.	N/A	N/A	10 ft.	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL:	N/A	1 ea.	2 ea.	N/A	N/A	10 ft.	N/A	N/A
See Explosive Issue / Usage Form and Magazine Data Cards for Accountability and Signatures.								

WEEKLY INVENTORY:

****NOTE: Per Final Work Plan, Final Explosives Safety Submission, Section 6. Response Actions, Page 6-4, Paragraph *6.4* <u>MEC and Disposition Process</u>: Donaldson Enterprise Inc. (DEI) provides explosives delivery and blaster services, as they have personnel with the necessary Hawaii Blasters Permit. (DEI) Makes one Explosives delivery each week so that any UXO items discovered during the field activities can be destroyed at the end of the work week.**

WEEKLY DETONATION POINTS:

Detonation Point	GPS (X)	GPS (Y)	Area Cleared of Post Blast Residue
BIP Item: (1) 3.5 inch Rocket	2194559.80881363	118311.930731159	Post Blast Clean-up / Restoration
BIP Item:			
BIP Item:			
Consolidation Point(s):			

COMMENTS ON DEMOLITION OPERATIONS:

Explosive Venting / Demolition Operations were conducted at South end of AOC #3 on Thursday 18MAR2010. Demolition was completed at Approximate 14:05 hrs.

SAFETY: **Reported Work Related Injuries/Illness On-Site**

WEEK DAY	USAE						Sub-Contractor						Total					
	LWD		Restricted		Other		LWD		Restricted		Other		L		R		O	
	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wednesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Friday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
See Individual Accident / Incident Reports for Specific Information.																		

COMMENTS:

N/A

DOWN TIME:

WEEK DAY	Time		Total Hours	Remarks
	From	To		
Sunday	N/A		0	N/A
See Operations Reports / Logs for Specific Information.				

GENERAL OBSERVATIONS:

All personnel were given site Training - Work Plan, SOPs, APP, SSHP, AHAs - on Monday 15MAR2010

Teams worked on Surface Clearance Operations in Area of Concern (AOC) #3.

Explosive Venting Operations were completed on Thursday 18MAR2010.

CLIENT/CUSTOMER, REGULATORY DIRECTIVES OR CHANGES TO OPERATIONS:

N/A

LESSONS LEARNED:

Safety Training / Briefs on - Work Plan, APP - SSHP, AHAs, MSDS, & SOPs / Vehicle Safety / Ordnance I.D.
& Safe Handling / Heat Stress / PPE / Archeological Concerns - all With general discussion of past experiences and lessons learned.

UXOQCS Signature:

David Heeks

USA ENVIRONMENTAL, INC. **WEEKLY QUALITY CONTROL REPORT**

CONTRACT No.: N62742-05-D-1868 **Task Order NO.: 0010**

SITE: Waikane Valley Impact Area RI/FS - Kaneohe, HI. **DATE: 27 / MAR / 2010**
USAE MOBILE PHONE: 1-813-695-4389
USAE SITE OFFICE PHONE: N/A

REPORT SUBMITTED BY: DAVID HEEKS **WEEK ENDING DATE: 27 / MAR / 2010**

PROJECT SCHEDULE: MON - THU / 0630 HRS TO 1700 HRS DAILY.

INSPECTIONS CONDUCTED (See Internal Audit List):

WEEK DAY	Inspection Areas						
	QCI of Overall Site	QCI of Teams	SHI of Overall Site	SHI of Teams	QC Meeting Daily / Weekly	QCI of Administration	QCI of Instruments
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	✓	✓	✓	✓	✓	✓	✓
Tuesday	✓	✓	✓	✓	✓	✓	✓
Wednesday	✓	✓	✓	✓	✓	✓	✓
Thursday	✓	✓	✓	✓	✓	✓	✓
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

QCI = Quality Control Inspection SHI = Safety and Health Inspection
See Separate Inspection Forms for the Task Checked.

ADMINISTRATIVE: Personnel On-Site

WEEK DAY	USAE		Sub-Contractors		Total		Visitor	Govn't
	Assigned	Present	Assigned	Present	Assigned	Present	Present	Present
Sunday	0	0	0	0	0	0	0	0
Monday	13	13	2	2	15	15	0	2
Tuesday	13	13	2	1	15	14	0	2
Wednesday	13	13	2	1	15	14	0	2
Thursday	13	13	3	3	16	16	0	2
Friday	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0

COMMENTS:

(2) Archeologists are on site daily.

(1) WillChee Planning on site Thursday for sampling Before and After Demo Operations were completed on (2) Items.

NOTICES OR NON-COMPLIANCE ISSUED:

WEEK DAY	Subject Items					Response	
	Work Plan	Safety Violation	Safety Comment	Quality Control	Other	Action Required and Date	Responsible Party Initials
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

OPERATIONS:

SITE OPERATIONS (WORKING)						
AOC #1 Surface	**AOC #2 Surface**	**AOC #3 Surface**	**AOC #4 Surface**	**BSI Surface**	**BSI Sub-Surface**	**BSI DGM**
1.8 Acres	**7.9 Acres**	**8.4 Acres**	**5.1 Acres**	**93**	**32**	**32**

QUALITY CONTROL INSPECTION (PASS / FAIL)													
AOC #1 Surface		**AOC #2 Surface**		**AOC #3 Surface**		**AOC #4 Surface**		**BSI Surface**		**BSI Sub-Surface**		**BSI**	
0	**0**	**0**	**0**	**3.19**	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**0**	**0**

See Grid / Area Inspection Forms for Location and Additional Information to include Blind Seed Items (BSI)

PERCENTAGE COMPLETED BY OPERATIONS						
AOC #1 Surface	**AOC #2 Surface**	**AOC #3 Surface**	**AOC #4 Surface**	**AOC's BSI Surface**	**BSI Sub-Surface**	**BSI DGM**
0 %	**0 %**	**38 %**	**0 %**	**17 %**	**0 %**	**0 %**

OPERATIONAL HEAVY EQUIPMENT ON-SITE						
Dump Truck	**Track-hoe**	**Back-hoe**	**Bob-Cat**	**Water Truck**	**Loader**	**Other**
0	0	0	0	0	0	N/A

NON-OPERATIONAL HEAVY EQUIPMENT						
Dump Truck	**Bulldozer**	**Back-hoe**	**Bob-Cat**	**Water Truck**	**Loader**	**Other**
0	0	0	0	0	0	N/A

COMMENTS:

N/A

INSTRUMENTATION:

Schonstedt(s): **Assigned**

Model	Serial No.	Operational	Condition	Passed ITP	Operator
GA-52Cx	174376	Yes	Good	Yes	J. Keene / Team #1
GA-52Cx	175685	Yes	Good	Yes	R. Martinez / Team #1
GA-52Cx	176076	Yes	Good	Yes	J. Black / Team #1
GA-52Cx	263720	Yes	Good	Yes	S. Kahakua / Team #1
GA-52Cx	177802	Yes	Good	Yes	M. Donaldson / Team #2
GA-52Cx	206568	Yes	Good	Yes	J. DeHerrera / Team #2
GA-52Cx	206574	Yes	Good	Yes	P. Hui / Team #2
GA-52Cx	176087	Yes	Good	Yes	C. Sullenberger / Team #2
GA-52Cx	192045	Yes	Good	Yes	Spare
GA-52Cx	177805	Yes	Good	Yes	D. Heeks / UXOQCS
GA-52Cx	206573	Yes	Good	Yes	R. Jenkins / UXOQC Asst.

Schonstedt(s): **Unserviceable**

Model	Serial No.	Operational	Condition	Passed ITP	Note
N/A					

COMMENTS:

N/A

WEEKLY EXPLOSIVES USAGE:

WEEK DAY	Explosives		Blasting caps		Tube / Cord		Other	
	Boosters	Perforators	Elect Caps	Non-Elect Caps	Non-EL	Det Cord 80 grain	Time Fuse	Other
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	2 ea.	2 ea.	N/A	N/A	20 ft.	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL:	N/A	2 ea.	2 ea.	N/A	N/A	20 ft.	N/A	N/A
See Explosive Issue / Usage Form and Magazine Data Cards for Accountability and Signatures.								

WEEKLY INVENTORY:

****NOTE: Per Final Work Plan, Final Explosives Safety Submission, Section 6. Response Actions, Page 6-4, Paragraph *6.4* <u>MEC and Disposition Process</u>: Donaldson Enterprise Inc. (DEI) provides explosives delivery and blaster services, as they have personnel with the necessary Hawaii Blasters Permit. (DEI) Makes one Explosives delivery each week so that any UXO items discovered during the field activities can be destroyed at the end of the work week.**

WEEKLY DETONATION POINTS:

Detonation Point	GPS (X)	GPS (Y)	Area Cleared of Post Blast Residue
BIP Item: (1) 2.36" HE Rocket	2194735.9543	118012.3880	Post Blast Clean-up / Restoration
BIP Item: (1) 2.36" HE Rocket	2194643.6159	117911.6111	Post Blast Clean-up / Restoration
BIP Item:			
Consolidation Point(s):			

COMMENTS ON DEMOLITION OPERATIONS:

Explosive Disposal (BIP) Operations were conducted at above listed coordinates in Central Eastern side of AOC #3 on Thursday 24MAR2010.

Demo Shot #1 - Shot detonation at approximately 14:10 PM / All clear at approximately 14:30 PM.

Demo Shot #2 - Shot detonation at approximately 15:00 PM / All clear at approximately 15:20 PM.

SAFETY: Reported Work Related Injuries/Illness On-Site

WEEK DAY	USAE						Sub-Contractor						Total					
	LWD		Restricted		Other		LWD		Restricted		Other		L		R		O	
	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wednesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Friday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
See Individual Accident / Incident Reports for Specific Information.																		

COMMENTS:

N/A

DOWN TIME:

WEEK DAY	Time		Total Hours	Remarks
	From	To		
Sunday	N/A		0	N/A
See Operations Reports / Logs for Specific Information.				

GENERAL OBSERVATIONS:

Team #1 and Team #2 worked on Surface Clearance Operations in Area of Concern (AOC) #3.
QC placed blinds seed items as required throughout the sweep area in AOC #3.
Explosive Disposal (BIP) Operations were completed on Thursday 25MAR2010.
Pre detonation and post detonation soil samples taken at 2 locations on Thursday 25MAR2010.

CLIENT/CUSTOMER, REGULATORY DIRECTIVES OR CHANGES TO OPERATIONS:

N/A

LESSONS LEARNED:

Safety Training / Briefs on - Work Plan, APP - SSHP, AHAs, MSDS, Water Hygiene / Vehicle Safety / Ordnance I.D. & Safe Handling / Emergency Response drill was completed in the field on Thursday 25MAR10 at 09:10 AM. - all With general discussion of past experiences and lessons learned.

UXOQCS Signature: [signature]

David Heeks

CONTRACT No.: N62742-05-D-1868 **Task Order NO.: 0010**

SITE: Waikane Valley Impact Area RI/FS - Kaneohe, HI. **DATE: 02 / APR / 2010**
USAE MOBILE PHONE: 1-813-695-4389
USAE SITE OFFICE PHONE: N/A

REPORT SUBMITTED BY: DAVID HEEKS **WEEK ENDING DATE: 03 / APR / 2010**

PROJECT SCHEDULE: MON - THU / 0630 HRS TO 1700 HRS DAILY.

INSPECTIONS CONDUCTED (See Internal Audit List):

WEEK DAY	Inspection Areas						
	QCI of Overall Site	QCI of Teams	SHI of Overall Site	SHI of Teams	QC Meeting Daily / Weekly	QCI of Administration	QCI of Instruments
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	✓	✓	✓	✓	✓	✓	✓
Tuesday	✓	✓	✓	✓	✓	✓	✓
Wednesday	✓	✓	✓	✓	✓	✓	✓
Thursday	✓	✓	✓	✓	✓	✓	✓
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

QCI = Quality Control Inspection SHI = Safety and Health Inspection
See Separate Inspection Forms for the Task Checked.

ADMINISTRATIVE: Personnel On-Site

WEEK DAY	USAE		Sub-Contractors		Total		Visitor	Govn't
	Assigned	Present	Assigned	Present	Assigned	Present	Present	Present
Sunday	0	0	0	0	0	0	0	0
Monday	14	13	2	2	16	15	0	2
Tuesday	14	14	2	2	16	16	0	4
Wednesday	14	14	3	2	17	16	0	2
Thursday	14	14	2	2	16	16	0	4
Friday	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0

COMMENTS:

(2) Archeologists are on site daily.
J. Keene off site on Monday 29MAR2010 do to a scheduling error for a physical from Workcare.
(2) ECC QA Personnel arrived on site Tuesday 30MAR2010 and Thursday 01APR2010.
(1) AECOS - Eric Guinther onsite Wednesday for a Natural Resources Survey Waikane Valley Impact / Training Area.

NOTICES OR NON-COMPLIANCE ISSUED:

WEEK DAY	Subject Items					Response	
	Work Plan	Safety Violation	Safety Comment	Quality Control	Other	Action Required and Date	Responsible Party Initials
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

OPERATIONS:

SITE OPERATIONS (WORKING)						
AOC #1 Surface	**AOC #2 Surface**	**AOC #3 Surface**	**AOC #4 Surface**	**BSI Surface**	**BSI Sub-Surface**	**BSI DGM**
1.8 Acres	**7.9 Acres**	**8.4 Acres**	**5.1 Acres**	**93**	**32**	**32**

QUALITY CONTROL INSPECTION (PASS / FAIL)													
AOC #1 Surface		**AOC #2 Surface**		**AOC #3 Surface**		**AOC #4 Surface**		**BSI Surface**		**BSI Sub-Surface**		**BSI**	
0	**0**	**0**	**0**	**4.35**	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**0**	**0**

See Grid / Area Inspection Forms for Location and Additional Information to include Blind Seed Items (BSI)

PERCENTAGE COMPLETED BY OPERATIONS						
AOC #1 Surface	**AOC #2 Surface**	**AOC #3 Surface**	**AOC #4 Surface**	**AOC's BSI Surface**	**BSI Sub-Surface**	**BSI DGM**
0 %	**0 %**	**52 %**	**0 %**	**17 %**	**0 %**	**0 %**

OPERATIONAL HEAVY EQUIPMENT ON-SITE						
Dump Truck	**Track-hoe**	**Back-hoe**	**Bob-Cat**	**Water Truck**	**Loader**	**Other**
0	0	0	0	0	0	N/A

NON-OPERATIONAL HEAVY EQUIPMENT						
Dump Truck	**Bulldozer**	**Back-hoe**	**Bob-Cat**	**Water Truck**	**Loader**	**Other**
0	0	0	0	0	0	N/A

COMMENTS:

N/A

INSTRUMENTATION:

Schonstedt(s): **Assigned**

Model	Serial No.	Operational	Condition	Passed ITP	Operator
GA-52Cx	174376	Yes	Good	Yes	J. Keene / Team #1
GA-52Cx	175685	Yes	Good	Yes	R. Martinez / Team #1
GA-52Cx	176076	Yes	Good	Yes	J. Black / Team #1
GA-52Cx	263720	Yes	Good	Yes	S. Kahakua / Team #1
GA-52Cx	177802	Yes	Good	Yes	M. Donaldson / Team #2
GA-52Cx	206568	Yes	Good	Yes	J. DeHerrera / Team #2
GA-52Cx	206574	Yes	Good	Yes	P. Hui / Team #2
GA-52Cx	176087	Yes	Good	Yes	C. Sullenberger / Team #2
GA-52Cx	192045	Yes	Good	Yes	Spare
GA-52Cx	177805	Yes	Good	Yes	D. Heeks / UXOQCS
GA-52Cx	206573	Yes	Good	Yes	R. Jenkins / UXOQC Asst.

Schonstedt(s): **Unserviceable**

Model	Serial No.	Operational	Condition	Passed ITP	Note
N/A					

COMMENTS:

N/A

WEEKLY EXPLOSIVES USAGE:

WEEK DAY	Explosives		Blasting caps		Tube / Cord		Other	
	Boosters	Perforators	Elect Caps	Non-Elect Caps	Non-EL	Det Cord 80 grain	Time Fuse	Other
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	66 ea.	6 ea.	N/A	N/A	430 ft.	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	3 ea.	4 ea.	N/A	N/A	20 ft.	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL:	N/A	69 ea.	10 ea.	N/A	N/A	450 ft.	N/A	N/A
See Explosive Issue / Usage Form and Magazine Data Cards for Accountability and Signatures.								

WEEKLY INVENTORY:

****NOTE: Per Final Work Plan, Final Explosives Safety Submission, Section 6. Response Actions, Page 6-4, Paragraph *6.4* <u>MEC and Disposition Process</u>: Donaldson Enterprise Inc. (DEI) provides explosives delivery and blaster services, as they have personnel with the necessary Hawaii Blasters Permit. (DEI) Makes one Explosives delivery each week so that any UXO items discovered during the field activities can be destroyed at the end of the work week.**

WEEKLY DETONATION POINTS:

Detonation Point	GPS (X)	GPS (Y)	Area Cleared of Post Blast Residue
(BIP): (1) 3.5" Suspect HEAT Rocket - determination (Practice)	2194516.3570	117820.7062	30/MAR Post Blast Clean-up / Restoration
(BIP): (1) 3.5" Suspect HEAT Rocket - determination (Practice)	2194354.1263	117893.6249	30/MAR Post Blast Clean-up / Restoration
(BIP): (1) 3.5" Suspect HEAT Rocket - determination (Practice)	2194344.9968	117836.1480	30/MAR Post Blast Clean-up / Restoration
(BIP): (1) 3.5" Suspect HEAT Rocket - determination (Practice)	2194466.6685	117865.4348	30/MAR Post Blast Clean-up / Restoration
(BIP): (1) 3.5" Suspect HEAT Rocket - determination (Practice)	2194535.3942	117846.3697	30/MAR Post Blast Clean-up / Restoration
(BIP): (1) 3.5" Suspect HEAT Rocket - determination (Practice)	2194564.3928	117715.1418	30/MAR Post Blast Clean-up / Restoration
(BIP): (1) 2.36" HEAT Rocket - Fuzed	2194428.3748	118273.3338	01/APR Post Blast Clean-up / Restoration
(BIP): (1) 2.36" HEAT Rocket - Fuzed	2194562.1427	117593.6809	01/APR Post Blast Clean-up / Restoration
Consolidation Point(s):			
(4) 2.36" HEAT / WH / Unfuzed	2194637.7559	117927.3935	30/MAR Post Blast Clean-up / Restoration
(1) 3.5" HEAT / WH / Unfuzed	2194637.7559	117927.3935	30/MAR Post Blast Clean-up / Restoration
(2) 2.36" BD Fuzes (only)	2194637.7559	117927.3935	30/MAR Post Blast Clean-up / Restoration
(1) M29 Rifle Grenade (Practice)	2194637.7559	117927.3935	30/MAR Post Blast Clean-up / Restoration
(84) 3.5" AT Practice Rockets	2194637.7559	117927.3935	30/MAR Post Blast Clean-up / Restoration
(2) 3.5" AT Practice Rockets	2194516.3570	117820.7062	30/MAR Post Blast Clean-up / Restoration
(1) 2.36" HEAT / WH / Unfuzed	2194428.3748	118273.3338	01/APR Post Blast Clean-up / Restoration

COMMENTS ON DEMOLITION OPERATIONS:

Explosive Disposal (BIP) Operations were conducted at above listed coordinates in AOC #3 on Tuesday 30MAR2010.

Demo Shot #1 - Shot detonation at approximately 12:51 PM / All clear at approximately 13:47 PM.

Demo Shot #2 - Shot detonation at approximately 12:52 PM / All clear at approximately 13:47 PM.

Demo Shot #2 - Shot detonation at approximately 12:57 PM / All clear at approximately 13:47 PM.

Explosive Disposal (BIP) Operations were conducted at above listed coordinates in AOC #3 on Thursday 01APR2010.

Demo Shot #1 - Shot detonation at approximately 15:24 PM / All clear at approximately 15:45 PM.

Demo Shot #2 - Shot detonation at approximately 15:28 PM / All clear at approximately 15:45 PM.

SAFETY: Reported Work Related Injuries/Illness On-Site

WEEK DAY	USAE						Sub-Contractor						Total					
	LWD		Restricted		Other		LWD		Restricted		Other		L		R		O	
	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wednesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Friday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
See Individual Accident / Incident Reports for Specific Information.																		

COMMENTS:

N/A

DOWN TIME:

WEEK DAY	Time		Total Hours	Remarks
	From	To		
Sunday	N/A		0	N/A
See Operations Reports / Logs for Specific Information.				

GENERAL OBSERVATIONS:

Team #1 and Team #2 worked on Surface Clearance Operations in Area of Concern (AOC) #3.
QC placed blinds seed items as required throughout the sweep area in AOC #3.
Explosive Disposal (BIP) Operations were completed on Tuesday 30MAR2010 and Thursday 01APR2010.

CLIENT/CUSTOMER, REGULATORY DIRECTIVES OR CHANGES TO OPERATIONS:

ECC arrived on site Tuesday 30MAR2010 and Thursday 1APR2010 for QA review of paperwork and site operations.

LESSONS LEARNED:

Safety Training / Briefs on - Work Plan, APP - SSHP, AHAs, MSDS / Heat Stress Signs and Symptoms / Vehicle Safety / Ordnance I.D.& Safe Handling. - All With general discussion of past experiences and lessons learned.

UXOQCS Signature:

David Heeks

USA ENVIRONMENTAL, INC. **WEEKLY QUALITY CONTROL REPORT**

CONTRACT No.: N62742-05-D-1868 **Task Order NO.: 0010**

SITE: Waikane Valley Impact Area RI/FS - Kaneohe, HI. **DATE: 08 / APR / 2010**
USAE MOBILE PHONE: 1-813-695-4389
USAE SITE OFFICE PHONE: N/A

REPORT SUBMITTED BY: DAVID HEEKS **WEEK ENDING DATE: 10 / APR / 2010**

PROJECT SCHEDULE: MON - THU / 0630 HRS TO 1700 HRS DAILY.

INSPECTIONS CONDUCTED (See Internal Audit List):

WEEK DAY	Inspection Areas						
	QCI of Overall Site	QCI of Teams	SHI of Overall Site	SHI of Teams	QC Meeting Daily / Weekly	QCI of Administration	QCI of Instruments
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	✓	✓	✓	✓	✓	✓	✓
Tuesday	✓	✓	✓	✓	✓	✓	✓
Wednesday	✓	✓	✓	✓	✓	✓	✓
Thursday	✓	✓	✓	✓	✓	✓	✓
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

QCI = Quality Control Inspection SHI = Safety and Health Inspection
See Separate Inspection Forms for the Task Checked.

ADMINISTRATIVE: Personnel On-Site

WEEK DAY	USAE		Sub-Contractors		Total		Visitor	Govn't
	Assigned	Present	Assigned	Present	Assigned	Present	Present	Present
Sunday	0	0	0	0	0	0	0	0
Monday	13	13	1	1	14	14	0	4
Tuesday	13	13	1	1	14	14	0	2
Wednesday	13	13	1	1	14	14	0	2
Thursday	13	13	2	2	15	15	0	4
Friday	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0

COMMENTS:

(2) Archeologists are on site daily.
S. Alu off site partial day on Monday 05APR2010 do to an issue with his hotel door not locking / Arrived @ 11:00 A.M.
(2) ECC QA Personnel on site Monday 05APR2010 and Thursday 08APR2010
(1) AECOS - Eric Guinther onsite Thursday for a Natural Resources Survey Waikane Valley Impact / Training Area.

NOTICES OR NON-COMPLIANCE ISSUED:

WEEK DAY	Subject Items					Response	
	Work Plan	Safety Violation	Safety Comment	Quality Control	Other	Action Required and Date	Responsible Party Initials
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

OPERATIONS:

SITE OPERATIONS (WORKING)						
AOC #1 Surface	**AOC #2 Surface**	**AOC #3 Surface**	**AOC #4 Surface**	**BSI Surface**	**BSI Sub-Surface**	**BSI DGM**
1.8 Acres	**7.9 Acres**	**8.4 Acres**	**5.1 Acres**	**93**	**32**	**32**

QUALITY CONTROL INSPECTION (PASS / FAIL)													
AOC #1 Surface		**AOC #2 Surface**		**AOC #3 Surface**		**AOC #4 Surface**		**BSI Surface**		**BSI Sub-Surface**		**BSI**	
0	**0**	**0**	**0**	**8.4**	**0**	**5.1**	**0**	**32**	**0**	**0**	**0**	**0**	**0**

See Grid / Area Inspection Forms for Location and Additional Information to include Blind Seed Items (BSI)

PERCENTAGE COMPLETED BY OPERATIONS						
AOC #1 Surface	**AOC #2 Surface**	**AOC #3 Surface**	**AOC #4 Surface**	**AOC's BSI Surface**	**BSI Sub-Surface**	**BSI DGM**
0 %	**0 %**	**100 %**	**100 %**	**34 %**	**0 %**	**0 %**

OPERATIONAL HEAVY EQUIPMENT ON-SITE						
Dump Truck	**Track-hoe**	**Back-hoe**	**Bob-Cat**	**Water Truck**	**Loader**	**Other**
0	0	0	0	0	0	N/A

NON-OPERATIONAL HEAVY EQUIPMENT						
Dump Truck	**Bulldozer**	**Back-hoe**	**Bob-Cat**	**Water Truck**	**Loader**	**Other**
0	0	0	0	0	0	N/A

COMMENTS:

Note: AOC #3 and AOC #4 will have Adjustments to actual acreage Surface Swept. The adjustments will be made once GPS information is processed at Oldsmar office. The Areas of Concern had sections with slopes greater than 30 degrees preventing personnel from clearing the areas. Final QC approval for Surface Sweep clearance in AOC#3 and AOC #4 is pending (BIP) / Demolition Operation and restoration of demo sites.

INSTRUMENTATION:

Schonstedt(s): **Assigned**

Model	Serial No.	Operational	Condition	Passed ITP	Operator
GA-52Cx	174376	Yes	Good	Yes	J. Keene / Team #1
GA-52Cx	175685	Yes	Good	Yes	R. Martinez / Team #1
GA-52Cx	176076	Yes	Good	Yes	J. Black / Team #1
GA-52Cx	263720	Yes	Good	Yes	S. Kahakua / Team #1
GA-52Cx	177802	Yes	Good	Yes	M. Donaldson / Team #2
GA-52Cx	206568	Yes	Good	Yes	J. DeHerrera / Team #2
GA-52Cx	206574	Yes	Good	Yes	P. Hui / Team #2
GA-52Cx	176087	Yes	Good	Yes	C. Sullenberger / Team #2
GA-52Cx	192045	Yes	Good	Yes	Spare
GA-52Cx	177805	Yes	Good	Yes	D. Heeks / UXOQCS
GA-52Cx	206573	Yes	Good	Yes	R. Jenkins / UXOQC Asst.

Schonstedt(s): **Unserviceable**

Model	Serial No.	Operational	Condition	Passed ITP	Note
N/A					

COMMENTS:

N/A

WEEKLY EXPLOSIVES USAGE:

WEEK DAY	Explosives		Blasting caps		Tube / Cord		Other	
	Boosters	Perforators	Elect Caps	Non-Elect Caps	Non-EL	Det Cord 80 grain	Time Fuse	Other
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
See Explosive Issue / Usage Form and Magazine Data Cards for Accountability and Signatures.								

WEEKLY INVENTORY:

****NOTE: Per Final Work Plan, Final Explosives Safety Submission, Section 6. Response Actions, Page 6-4, Paragraph *6.4* MEC and Disposition Process: Donaldson Enterprise Inc. (DEI) provides explosives delivery and blaster services, as they have personnel with the necessary Hawaii Blasters Permit. (DEI) Makes one Explosives delivery each week so that any UXO items discovered during the field activities can be destroyed at the end of the work week.**

WEEKLY DETONATION POINTS:

Detonation Point	GPS (X)	GPS (Y)	Area Cleared of Post Blast Residue
BIP Item: N/A			
BIP Item:			
BIP Item:			
Consolidation Point(s):			
N/A			

COMMENTS ON DEMOLITION OPERATIONS:

No demolition operations this week.

SAFETY: **Reported Work Related Injuries/Illness On-Site**

WEEK DAY	USAE						Sub-Contractor						Total					
	LWD		Restricted		Other		LWD		Restricted		Other		L		R		O	
	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wednesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Friday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
See Individual Accident / Incident Reports for Specific Information.																		

COMMENTS:

N/A

DOWN TIME:

WEEK DAY	Time		Total Hours	Remarks
	From	To		
Sunday	N/A		0	N/A
See Operations Reports / Logs for Specific Information.				

GENERAL OBSERVATIONS:

Team #1 and Team #2 worked on Surface Clearance Operations in Area of Concern (AOC) #3 and #4.
(2) Archeologists were on site daily to observe and advise personnel during clearance operations.
UXO Avoidance escort was provided for AECOS (botanist) study on Thursday 08APR2010.
QC placed blinds seed items as required throughout the surface swept areas in AOC #3 and AOC #4.
QC checks were accomplished behind sweep personnel during Surface Sweep Operations in AOC #3 and AOC #4.

CLIENT/CUSTOMER, REGULATORY DIRECTIVES OR CHANGES TO OPERATIONS:

ECC on site Monday 05APR2010 and Thursday 08APR2010 - QA review of paperwork and site operations - Departed On Thursday 08APR2010.

LESSONS LEARNED:

Safety Training / Briefs on - Work Plan, APP - SSHP, AHAs, MSDS / Heat Stress / Vehicle Safety / Ordnance I.D. & Safe Handling / Use of repellants to protect against insect bites / - All With general discussion of past experiences and lessons learned.

UXOQCS Signature: David Heeks

CONTRACT No.: N62742-05-D-1868 **Task Order NO.: 0010**

SITE: Waikane Valley Impact Area RI/FS - Kaneohe, HI. **DATE: 16 / APR / 2010**
USAE MOBILE PHONE: 1-813-695-4389
USAE SITE OFFICE PHONE: N/A

REPORT SUBMITTED BY: DAVID HEEKS **WEEK ENDING DATE: 17 / APR / 2010**

PROJECT SCHEDULE: MON - THU / 0630 HRS TO 1700 HRS DAILY.

INSPECTIONS CONDUCTED (See Internal Audit List):

WEEK DAY	Inspection Areas						
	QCI of Overall Site	QCI of Teams	SHI of Overall Site	SHI of Teams	QC Meeting Daily / Weekly	QCI of Administration	QCI of Instruments
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	✓	✓	✓	✓	✓	✓	✓
Tuesday	✓	✓	✓	✓	✓	✓	✓
Wednesday	✓	✓	✓	✓	✓	✓	✓
Thursday	✓	✓	✓	✓	✓	✓	✓
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

QCI = Quality Control Inspection SHI = Safety and Health Inspection
See Separate Inspection Forms for the Task Checked.

ADMINISTRATIVE: Personnel On-Site

WEEK DAY	USAE		Sub-Contractors		Total		Visitor	Govn't
	Assigned	Present	Assigned	Present	Assigned	Present	Present	Present
Sunday	0	0	0	0	0	0	0	0
Monday	15	15	1	1	16	16	0	2
Tuesday	15	15	4	4	19	19	0	2
Wednesday	15	15	1	1	16	16	0	2
Thursday	15	15	2	2	17	17	0	2
Friday	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0

COMMENTS:

(2) Archeologists are on site daily.
Robert Rice mobilized on 11APR2010 - Sunday for UXOQCS Asst. Tech II position
R. Jenkins assumes the UXOSO position as of 12APR2010 for the remainder of the project.
(1) CH2M Hill Observing Site Operations for final report input - specific observation - soil sampling Tuesday 13APR2010.
(2) Wil Chee Planning Soil Sample Collections on site Tuesday 13APR2010.
J. Keene - medical - infection in right elbow from scrape / extended first aide on Wednesday 14APR2010.
(1) Wil Chee Planning - Pre/Post Blast Soil Sample Collections on site Thursday 15APR2010.

NOTICES OR NON-COMPLIANCE ISSUED:

WEEK DAY	Subject Items					Response	
	Work Plan	Safety Violation	Safety Comment	Quality Control	Other	Action Required and Date	Responsible Party Initials
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

OPERATIONS:

SITE OPERATIONS (WORKING)						
AOC #1 Surface	AOC #2 Surface	AOC #3 Surface	AOC #4 Surface	BSI Surface	BSI Sub-Surface	BSI DGM
1.8 Acres <1.53> 30° + / Slope	7.9 Acres <5.23> 30° + / Slope	8.4 Acres <3.03> 30° + / Slope	5.09 Acres <3.79> 30° + / Slope	42	32	32

QUALITY CONTROL INSPECTION (PASS / FAIL)													
AOC #1 Surface		AOC #2 Surface		AOC #3 Surface		AOC #4 Surface		BSI Surface		BSI Sub-Surface		BSI	
0.27	0	2.67	0	5.75	0	1.30	0	42	0	0	0	0	0

See Grid / Area Inspection Forms for Location and Additional Information to include Blind Seed Items (BSI)

PERCENTAGE COMPLETED BY OPERATIONS						
AOC #1 Surface	AOC #2 Surface	AOC #3 Surface	AOC #4 Surface	AOC's BSI Surface	BSI Sub-Surface	BSI DGM
100 %	100 %	100 %	100 %	100 %	0 %	0 %

OPERATIONAL HEAVY EQUIPMENT ON-SITE						
Dump Truck	Track-hoe	Back-hoe	Bob-Cat	Water Truck	Loader	Other
0	0	0	0	0	0	N/A

NON-OPERATIONAL HEAVY EQUIPMENT						
Dump Truck	Bulldozer	Back-hoe	Bob-Cat	Water Truck	Loader	Other
0	0	0	0	0	0	N/A

COMMENTS:

Note: AOC #1, #2 and #3 will have Adjustments to actual acreage Surface Swept. The adjustments will be made once GPS information is processed at Oldsmar office. The Areas of Concern had sections with slopes greater than 30 degrees preventing personnel from clearing the areas. Final QC approval for Surface Sweep areas in AOC#1, #2, #3, and #4 will Completed during the next work cycle.

INSTRUMENTATION:

Schonstedt(s): **Assigned**

Model	Serial No.	Operational	Condition	Passed ITP	Operator
GA-52Cx	174376	Yes	Good	Yes	J. Keene / Team #1
GA-52Cx	175685	Yes	Good	Yes	R. Martinez / Team #1
GA-52Cx	176076	Yes	Good	Yes	J. Black / Team #1
GA-52Cx	263720	Yes	Good	Yes	S. Kahakua / Team #1
GA-52Cx	177802	Yes	Good	Yes	M. Donaldson / Team #2
GA-52Cx	206568	Yes	Good	Yes	J. DeHerrera / Team #2
GA-52Cx	206574	Yes	Good	Yes	P. Hui / Team #2
GA-52Cx	176087	Yes	Good	Yes	C. Sullenberger / Team #2
GA-52Cx	192045	Yes	Good	Yes	Spare
GA-52Cx	177805	Yes	Good	Yes	D. Heeks / UXOQCS
GA-52Cx	206573	Yes	Good	Yes	R. Rice / UXOQC Asst.

Schonstedt(s): **Unserviceable**

Model	Serial No.	Operational	Condition	Passed ITP	Note
N/A					

COMMENTS:

N/A

WEEKLY EXPLOSIVES USAGE:

WEEK DAY	Explosives		Blasting caps		Tube / Cord		Other	
	Boosters	Perforators	Elect Caps	Non-Elect Caps	Non-EL	Det Cord 80 grain	Time Fuse	Other
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	13 ea.	10 ea.	N/A	N/A	150 ft.	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL:	N/A	13 ea.	10 ea.	N/A	N/A	150 ft.	N/A	N/A
See Explosive Issue / Usage Form and Magazine Data Cards for Accountability and Signatures.								

WEEKLY INVENTORY:

****NOTE: Per Final Work Plan, Final Explosives Safety Submission, Section 6. Response Actions, Page 6-4, Paragraph *6.4* <u>MEC and Disposition Process</u>: Donaldson Enterprise Inc. (DEI) provides explosives delivery and blaster services, as they have personnel with the necessary Hawaii Blasters Permit. (DEI) Makes one Explosives delivery each week so that any UXO items discovered during the field activities can be destroyed at the end of the work week.**

WEEKLY DETONATION POINTS:

Detonation Point	GPS (X)	GPS (Y)	Area Cleared of Post Blast Residue
(BIP): (1) 3.5" Suspect HEAT Rocket - Fuzed / Fired	617102.3722	2378085.808	15/APR Post Blast Clean-up / Restoration AOC #3
(BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	616985.8438	2377892.361	15/APR Post Blast Clean-up / Restoration AOC #3
(BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	616953.0664	2377949.086	15/APR Post Blast Clean-up / Restoration AOC #4
(BIP): (1) M28 Rifle Grenade Fuzed / Fired / Confirmed Practice	617213.7947	2377871.478	15/APR Post Blast Clean-up / Restoration AOC #4
(BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	617220.5321	2377861.326	15/APR Post Blast Clean-up / Restoration AOC #4
(BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	617211.3353	2377882.827	15/APR Post Blast Clean-up / Restoration AOC #4
(BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	617219.7530	2377866.197	15/APR Post Blast Clean-up / Restoration AOC #4
(BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	617220.9553	2377863.841	15/APR Post Blast Clean-up / Restoration AOC #4
(BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	617221.7545	2377864.576	15/APR Post Blast Clean-up / Restoration AOC #4
(BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	617234.9562	2377864.995	15/APR Post Blast Clean-up / Restoration AOC #4
(BIP): (1) M28 Riffle Grenade Fuzed / Fired	616883.8648	2377942.270	15/APR Post Blast Clean-up / Restoration AOC #2
Consolidation Point(s):			
(1) M30 Practice Grenade / Unfuzed - Sheared off / Confirmed w/ Energetics	616985.8438	2377892.361	15/APR Post Blast Clean-up / Restoration AOC #3
(1) 60mm HE Mortar / Unfuzed - Sheared / Fired	617102.3722	2378085.808	15/APR Post Blast Clean-up / Restoration AOC #3
(1) ¼ lbs. M030 TNT Demolition Block	616985.8438	2377892.361	15/APR Post Blast Clean-up / Restoration AOC #3

COMMENTS ON DEMOLITION OPERATIONS:

Demolition Operations were conducted on Thursday 15APR2010 with (2) Shots located in AOC #4, (2) Shots in AOC #3, (1) Shot in AOC #2 - Demolition shots were completed at 1415 hrs. / final All Clear was given at 1445 hrs.

SAFETY: **Reported Work Related Injuries/Illness On-Site**

WEEK DAY	USAE						Sub-Contractor						Total					
	LWD		Restricted		Other		LWD		Restricted		Other		L		R		O	
	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wednesday	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Thursday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Friday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
See Individual Accident / Incident Reports for Specific Information.																		

COMMENTS:

J. Keene - infection in right elbow from scrape - medical treatment on Wednesday 14APR2010 (See Injury Report).

DOWN TIME:

WEEK DAY	Time		Total Hours	Remarks
	From	To		
Sunday	N/A		0	N/A
See Operations Reports / Logs for Specific Information.				

GENERAL OBSERVATIONS:

Team #1 and Team #2 worked on Surface Clearance Operations in Area of Concern (AOC) #1 and #2 and
Wil Chee Planning - Soil Sample collections were taken in AOC #5 Waikane Stream: Down / Mid / & Up Stream DUs - (3)
Composite Samples on Tuesday 13APR / Pre & Post Blast samples were taken at (8) location on Thursday 15APR2010.
QC placed BSI's as required throughout the sweep area in AOC #1 & #2 / Verified Soil Samples / Verified Slopes.
Explosive Disposal (BIP) Operations were conducted on Thursday 15APR2010 in AOC #4, AOC #3, & AOC #2.

CLIENT/CUSTOMER, REGULATORY DIRECTIVES OR CHANGES TO OPERATIONS:

N/A

LESSONS LEARNED:

Safety Training / Briefs on - Work Plan, APP - SSHP, AHAs, MSDS / initial first aid for Puncture Wounds / Vehicle Safety /
Ordnance I.D.& Safe Handling. - All With general discussion of past experiences and lessons learned.

UXOQCS Signature:

David Heeks

April 20, 2010
08:00 HST, 14:00 EDT

Former Waikane Valley Training Area Remedial Investigation CTO 013
Weekly Quality Control (QC) Meeting Minutes

1. Tom Bernitt, Program QC Manager, chaired the Weekly QC Meeting and called the meeting to order at 8:00 HST.
2. Persons in Attendance:

   Tom Bernitt, Program QC Manager, USAE
   Bob Nore, Project Manager, USAE
   Dan Miller, Site Manager, USAE
   David Heeks, UXOQCS, USAE
   James Walden, UXOQC Manager, USAE (recorder)

3. Summation of work accomplished during the previous week (4/12-16/2010)

   David Heeks:
   - The surface clearance was done with the exception of "fine tuning" the acreage cleared versus the acreage non-clearable where the slope exceeds 30 degrees.
   - The samples have been taken by Wil Chee Planning for all required demolition locations.
   - Multi-incremental sampling began in AOC 1 and 2 and will continue in AOC 3 and 4 today.

4. Projected work during the current week (4/19-23/2010)

   Dan Miller:
   - Began the grid layout in the surface cleared areas in each of the AOCs.
   - Vegetation cutting as necessary to conduct subsurface operations will follow.
   - Wil Chee Planning, accompanied by a UXO Technician and an archaeologist, are conducting multi-incremental samples, three samples per decision unit [there are 10 Decision Units (DU), AOC 1 is one DU, AOCs 2,3, and 4 are divided into three DU each], for a total of thirty samples.
   - Subsurface investigation will begin this week once the multi-incremental sampling is completed (a cataloging of the archaeological assets will not be available until sampling is completed).

5. Quality Issues

   - The seed items (1-inch by 6-inch sections of pipe) are being placed at 6-inch and 1-foot depths; the seed items at 1-foot are difficult to locate (the instruments are able to locate seed items in the ITS).

- To resolve this issue, munitions debris items [practice 3.5-inch rocket warheads or base sections of 75mm projectiles (appropriately tagged and identified as seed items)] will be buried at depths deeper than 1-foot.

6. Other Issues

Project extension/completion

Dan Miller:

- Projects that the subsurface sampling will be done by the end of next week and the 2-foot and 3-foot soil borings will be completed on Tuesday and Wednesday of next week.
- An EM-61 survey and scrap removal remains to be completed.
- Time needed to complete the EM-61 and scrap removal from the jungle will possibly require the project be extended until mid-May.

MEC identified during the Site Inspection (SI)

The UXO Teams have pursued the MEC items, outside of the AOC, that were identified during the SI and these items have been annotated in the MEC Accountability Log.

Extent of MEC contamination

The areas not covered by the AOCs and the areas greater than 30 degrees possibly have surface MEC (or MD) contamination. To determine the extent of the contamination, the UXO Technicians may be required to pursue a course of action similar to that used during the SI (meandering transits) where possible in an attempt to better characterize the extent of MEC contamination of the site. To be addressed in consultation with the Navy based on scope/budget/schedule.

7. Scheduled next meeting

Next meeting scheduled for Monday 26 April, 1500 EDT/0900 HST

April 26, 2010
09:00 HST, 12:00 PDT and 15:00 EDT

Former Waikane Valley Training Area Remedial Investigation CTO 013
Weekly Quality Control (QC) Meeting Minutes

1. Tom Bernitt, Program QC Manager, chaired the Weekly QC Meeting and called the meeting to order at 09:00 HST.
2. Persons in Attendance:

   Tom Bernitt, Program QC Manager, USAE
   David Heeks, UXOQCS, USAE
   James Walden, UXOQC Manager, USAE (recorder)

3. Summation of work accomplished during the previous week (4/19-23/2010)

   David Heeks:
   - The acreage cleared versus the acreage non-clearable where the slope exceeds 30 degrees has been finalized (see the Weekly QC Report for final acres for each AOC).
   - Placed blind seed items (BSI) in all grids in AOC 3 and 4.
   - Observed UXO teams 1 and 2 conducting Vegetation Removal and Sub-surface Clearance in AOC 3 (8 grids) and AOC 4 (6 grids).
   - Tracked BSI recovery in AOC 3 and 4.
   - Verified slope inclination.
   - Observed Multi-incremental soil sampling completion in all Decision Units.
   - Reacquired suspect MEC items located during the Site Inspection.
   - Observed MEC characterization beyond the AOCs.

   No quality deficiencies or failures occurred.

4. Projected work during the current week (4/26-30/2010)

   David Heeks:
   - Began the grid layout in the surface cleared areas in each of the AOCs.
   - Vegetation cutting as necessary to conduct subsurface operations that will follow.
   - Wil Chee Planning, accompanied by a UXO Technician and an archaeologist, is conducting multi-incremental samples, three samples per decision unit [there are 10 Decision Units (DU), AOC 1 is one DU, AOCs 2,3, and 4 are divided into three DU each], for a total of thirty samples.
   - Subsurface investigation will begin this week once the multi-incremental sampling is completed (a cataloging of the archaeological assets will not be available until sampling is completed).

5. Quality Issues

    - In order to simulate actual size and configuration of anticipated MEC, QC team began using munitions debris items, practice 3.5-inch rocket warheads and/or expended rocket motors as BSI at depths deeper than 1-foot. Teams are recovering these BSI without issue.
    - Will verify DGM personnel's qualifications and training (specifically HAZWOPER) for entering site and that they receive required Safety and Health briefings and review WP.
    - Once the DGM team is operational and determine the areas where DGM surveys will be conducted, QC will place BSIs as required by WP.

6. Other Issues

    Project extension/completion

    - At this point, it appears project will be completed by May 15, 2010. The time requirement to complete the geophysical effort is undetermined at this time; accessibility and the amount of area selected for DGM survey will determine the level of effort.

    Munitions Debris

    A helicopter service has been identified to support the movement of munitions debris and scrap from the AOCs to the containerization point.

    Personnel Staffing

    - Dan Miller will be leaving the project by April 30, 2010; the SUXOS (David Wilson) will assume the duties of the Site Manager for the remainder of the project.
    - Additional staffing will come onboard as a result of the extension through May 15, 2010. The UXOQCS will ensure new personnel have qualifications meet the requirements for their respective positions.

7. Scheduled next meeting

    Next meeting scheduled for Monday 3 May, 15:00 EDT/12:00 PDT/09:00 HST.

CONTRACT No.: N62742-05-D-1868 **Task Order NO.: 0010**

SITE: Waikane Valley Impact Area RI/FS - Kaneohe, HI. **DATE: 30 / APR / 2010**
USAE MOBILE PHONE: 1-813-695-4389
USAE SITE OFFICE PHONE: N/A

REPORT SUBMITTED BY: DAVID HEEKS **WEEK ENDING DATE: 01 / MAY / 2010**

PROJECT SCHEDULE: MON - THU / 0630 HRS TO 1700 HRS DAILY.

INSPECTIONS CONDUCTED (See Internal Audit List):

WEEK DAY	Inspection Areas						
	QCI of Overall Site	QCI of Teams	SHI of Overall Site	SHI of Teams	QC Meeting Daily / Weekly	QCI of Administration	QCI of Instruments
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	✓	✓	✓	✓	✓	✓	✓
Tuesday	✓	✓	✓	✓	✓	✓	✓
Wednesday	✓	✓	✓	✓	✓	✓	✓
Thursday	✓	✓	✓	✓	✓	✓	✓
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

QCI = Quality Control Inspection SHI = Safety and Health Inspection
See Separate Inspection Forms for the Task Checked.

ADMINISTRATIVE: Personnel On-Site

WEEK DAY	USAE		Sub-Contractors		Total		Visitor	Govn't
	Assigned	Present	Assigned	Present	Assigned	Present	Present	Present
Sunday	0	0	0	0	0	0	0	0
Monday	16	16	4	4	19	19	0	2
Tuesday	16	16	9	9	25	25	0	2
Wednesday	16	16	5	5	21	21	0	2
Thursday	16	16	5	5	21	21	0	2
Friday	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0

COMMENTS:

A. Crandall and R. Macneil Mobilized to the jobsite on Sunday. / (2) Archeologists are on site daily.
J. Black - Muscle spasms in back - arrived at staging area at 1115 Hours on Monday 26APR10 / light duty Tuesday.
(3) Wil Chee Planning Soil Sample Collections on Monday 26APR2010 - DU #1 through DU #7 in AOC #1, #2 and #3.
(3/4) Control Points Survey on site - Establishing controls & recording grid corners Monday - Thursday 26-29APR2010.
(3) Wil Chee Planning Soil Sample Collections on Tuesday 27APR2010 - DU #8 through DU #10 in AOC #4.
(2) CH2MH on site to observe Soil Sampling (Down Hole Boring w/ Hand Auger) Tuesday 28APR2010.
(3) personnel Demobilize from site D. Miller, J. Keene, and C. Sullenberger on Friday and Saturday this week.

NOTICES OR NON-COMPLIANCE ISSUED:

WEEK DAY	Subject Items					Response	
	Work Plan	Safety Violation	Safety Comment	Quality Control	Other	Action Required and Date	Responsible Party Initials
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

OPERATIONS:

SITE OPERATIONS (WORKING)						
AOC #1, #2, #3 & #4 Surface	AOC #1 Sub-Surface Grids (3)	AOC #2 Sub-Surface Grids (8)	AOC #3 Sub-Surface Grids (8)	AOC #4 Sub-Surface Grids (6)	DGM Grids AOC #1, #2, #3 & #4	BSI Surface / Sub-Surface / DGM - Sub Surface
23.22 Acres <12.47> 30°+/ Slope	(3)	(8)	(8)	(6)	(8)	(92)

QUALITY CONTROL INSPECTION (PASS / FAIL)													
AOC #1, #2, #3 & #4 Surface		AOC #1 Sub-Surface Grids		AOC #2 Sub-Surface Grids		AOC #3 Sub-Surface Grids		AOC #4 Sub-Surface Grids		DGM Grids AOC #1, #2, #3 & #4		BSI Surface / Sub-Surface / DGM - Sub Surface	
11.01	0	3	0	8	0	8	0	6	0	5	0	88	0

See Grid / Area Inspection Forms for Location and Additional Information to include Blind Seed Items (BSI)

PERCENTAGE COMPLETED BY OPERATIONS						
AOC #1, #2, #3 & #4 Surface	AOC #2 Sub-Surface Grids	AOC #2 Sub-Surface Grids	AOC #3 Sub-Surface Grids	AOC #4 Sub-Surface Grids	DGM Grids AOC #1, #2, #3 & #4	BSI Surface / Sub-Surface / DGM - Sub surface
100 %	100 %	100 %	100 %	100 %	63 %	96 %

OPERATIONAL HEAVY EQUIPMENT ON-SITE						
Dump Truck	Track-hoe	Back-hoe	Bob-Cat	Water Truck	Loader	Other
0	0	0	0	0	0	N/A

NON-OPERATIONAL HEAVY EQUIPMENT						
Dump Truck	Bulldozer	Back-hoe	Bob-Cat	Water Truck	Loader	Other
0	0	0	0	0	0	N/A

COMMENTS:

N/A

INSTRUMENTATION:

Schonstedt(s): **Assigned**

Model	Serial No.	Operational	Condition	Passed ITP	Operator
GA-52Cx	174376	Yes	Good	Yes	J. Keene / Team #1
GA-52Cx	176076	Yes	Good	Yes	J. Black / Team #1
GA-52Cx	263720	Yes	Good	Yes	S. Kahakua / Team #1
GA-52Cx	177802	Yes	Good	Yes	M. Donaldson / Team #2
GA-52Cx	206568	Yes	Good	Yes	J. DeHerrera / Team #2
GA-52Cx	206574	Yes	Good	Yes	P. Hui / Team #2
GA-52Cx	176087	Yes	Good	Yes	C. Sullenberger / Team #2
GA-52Cx	192045	Yes	Good	Yes	Spare
GA-52Cx	177805	Yes	Good	Yes	D. Heeks / UXOQCS
GA-52Cx	206573	Yes	Good	Yes	R. Rice / UXOQC Asst.

Schonstedt(s): **Unserviceable**

Model	Serial No.	Operational	Condition	Passed ITP	Note
N/A					

COMMENTS:

N/A

WEEKLY EXPLOSIVES USAGE:

WEEK DAY	Explosives		Blasting caps		Tube / Cord		Other	
	Boosters	Perforators	Elect Caps	Non-Elect Caps	Non-EL	Det Cord 80 grain	Time Fuse	Other
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	5 ea.	6 ea.	N/A	N/A	95 ft.	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL:	N/A	5 ea.	6 ea.	N/A	N/A	95 ft.	N/A	N/A
See Explosive Issue / Usage Form and Magazine Data Cards for Accountability and Signatures.								

WEEKLY INVENTORY:

****NOTE: Per Final Work Plan, Final Explosives Safety Submission, Section 6. Response Actions, Page 6-4, Paragraph *6.4* MEC and Disposition Process: Donaldson Enterprise Inc. (DEI) provides explosives delivery and blaster services, as they have personnel with the necessary Hawaii Blasters Permit. (DEI) Makes one Explosives delivery each week so that any UXO items discovered during the field activities can be destroyed at the end of the work week.**

WEEKLY DETONATION POINTS:

Detonation Point	GPS (X)	GPS (Y)	Area Cleared of Post Blast Residue
(#369 - BIP): (1) M28 HEAT Rifle Grenade Fuzed / Fired	617152.132	237908.681	29/APR Post Blast Clean-up / Restoration
(#403 - BIP): (1) 3.5" HE Rocket Fuzed / Fired	617145.5328	2378111.039	29/APR Post Blast Clean-up / Restoration
(#438 - BIP): (1) 2.36" HE Rocket Fuzed / (No Motor)	616978.2552	2378110.599	29/APR Post Blast Clean-up / Restoration
Consolidation Point(s):			
(3) 75mm partial / pieces (MPPEH)	616978.2552	2378110.599	29/APR Post Blast Clean-up / Restoration
(1) 2.36 inch Rocket Motor (MPPEH)	617145.5328	2378111.039	29/APR Post Blast Clean-up / Restoration

COMMENTS ON DEMOLITION OPERATIONS:

(3) Detonations were completed on Thursday 29APR2010 at approximately 1240 Hrs / All Clear was given at 1320 Hrs.

SAFETY: **Reported Work Related Injuries/Illness On-Site**

WEEK DAY	USAE						Sub-Contractor						Total					
	LWD		Restricted		Other		LWD		Restricted		Other		L		R		O	
	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Tuesday	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Wednesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Friday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
See Individual Accident / Incident Reports for Specific Information.																		

COMMENTS:

J. Black had back spasms on Monday 26APR2010 / light duty on Tuesday 27APR2010 and returned to full duty on Wednesday 28APR2010. (Incident was recorded)

DOWN TIME:

WEEK DAY	Time		Total Hours	Remarks
	From	To		
Sunday	N/A		0	N/A
See Operations Reports / Logs for Specific Information.				

GENERAL OBSERVATIONS:

Team #1 and Team #2 worked on Vegetation Removal and Sub-Surface Clearance Operations in Area of Concern (AOC) #2 with (8) grids and AOC #1 with (3) grids.

Wil Chee Planning - Soil Sample collections were taken - Bore Samples w/ Hand Auger- Decision Units (DU)s - (1-10) in AOC #1, #2, #3, & #4 on Monday 26APR2010 and Tuesday 27APR2010 - completing all (10) Decision Units.

QC placed BSI's as required in Sub-Surface Grids - AOC #2 - (8) Grids / AOC #1 - (3) Grids / Verified Soil Samples were taken / Observed Vegetation Removal / Observed Intrusive Operations / Tracked BSI recovery / Re-acquired Suspect MEC items located during (SI) / MEC Characterization of exterior of AOCs / Seeding for DGM.

Control Points Survey was on site - Established controls recorded points - Surveyed in grid corners AOC #4 & #3.

CLIENT/CUSTOMER, REGULATORY DIRECTIVES OR CHANGES TO OPERATIONS:

N/A

LESSONS LEARNED:

Safety Training / Briefs on - Work Plan, APP - SSHP, AHAs, MSDS / Medical - Accident Reporting Bone & Joint Injuries, Electrolites imbalance Vehicle Safety / Ordnance I.D.& Safe Handling - New personnel on site were briefed on the WP, APP - SSHP, AHAs, and SOPs. All With general discussion of past experiences and lessons learned.

UXOQCS Signature: [signature]

David Heeks

CONTRACT No.: **N62742-05-D-1868** **Task Order NO.:** **0010**

SITE: **Waikane Valley Impact Area RI/FS - Kaneohe, HI.** **DATE:** **02 / MAY / 2010**
USAE MOBILE PHONE: **1-813-695-4389**
USAE SITE OFFICE PHONE: **N/A**

REPORT SUBMITTED BY: **DAVID HEEKS** **WEEK ENDING DATE:** **08 / MAY / 2010**

PROJECT SCHEDULE: **MON - THU / 0630 HRS TO 1700 HRS DAILY.**

INSPECTIONS CONDUCTED (See Internal Audit List):

WEEK DAY	**Inspection Areas**						
	QCI of Overall Site	QCI of Teams	SHI of Overall Site	SHI of Teams	QC Meeting Daily / Weekly	QCI of Administration	QCI of Instruments
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	✓	✓	✓	✓	✓	✓	✓
Tuesday	✓	✓	✓	✓	✓	✓	✓
Wednesday	✓	✓	✓	✓	✓	✓	✓
Thursday	✓	✓	✓	✓	✓	✓	✓
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

QCI = Quality Control Inspection SHI = Safety and Health Inspection
See Separate Inspection Forms for the Task Checked.

ADMINISTRATIVE: **Personnel On-Site**

WEEK DAY	**USAE**		**Sub-Contractors**		**Total**		**Visitor**	**Govn't**
	Assigned	Present	Assigned	Present	Assigned	Present	Present	Present
Sunday	0	0	0	0	0	0	0	0
Monday	14	14	5	5	19	19	0	2
Tuesday	14	14	5	5	19	19	0	2
Wednesday	12	12	7	7	19	19	0	2
Thursday	11	11	6	6	17	17	0	5
Friday	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0

COMMENTS:

B. Thompson Mobilized to the jobsite on Sunday 02MAY2010 / (2) Archeologists are on site daily.
(4) Control Points Survey on site - Setting Controls & Recording grid corners Monday - Thursday 03-06MAY2010.
(1) Wil Chee Planning Soil Sample Collection for background on site Wednesday 05MAY2010.
(1) Helicopter was provided for MD / Scrap lifts on site Wednesday & Thursday 05May - 06MAY2010.
(2) A. Crandall / R. MacNeil personnel Demobilized from the site on Wednesday 05MAY2010.
(1) D. Heeks Demobilize from site on Thursday 06MAY2010.

NOTICES OR NON-COMPLIANCE ISSUED:

WEEK DAY	Subject Items					Response	
	Work Plan	Safety Violation	Safety Comment	Quality Control	Other	Action Required and Date	Responsible Party Initials
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

OPERATIONS:

SITE OPERATIONS (WORKING)						
AOC #1, #2, #3 & #4 Surface	AOC #1 Sub-Surface Grids (3)	AOC #2 Sub-Surface Grids (8)	AOC #3 Sub-Surface Grids (8)	AOC #4 Sub-Surface Grids (6)	DGM Grids AOC #1, #2, #3 & #4	BSI Surface / Sub-Surface / DGM - Sub Surface
23.22 Acres <12.47> 30°+/ Slope	(3)	(8)	(8)	(6)	(8)	(98)

QUALITY CONTROL INSPECTION (PASS / FAIL)													
AOC #1, #2, #3 & #4 Surface		AOC #1 Sub-Surface Grids		AOC #2 Sub-Surface Grids		AOC #3 Sub-Surface Grids		AOC #4 Sub-Surface Grids		DGM Grids AOC #1, #2, #3 & #4		BSI Surface / Sub-Surface / DGM - Sub Surface	
11.01	0	3	0	8	0	8	0	6	0	8	0	98	0

See Grid / Area Inspection Forms for Location and Additional Information to include Blind Seed Items (BSI)

PERCENTAGE COMPLETED BY OPERATIONS						
AOC #1, #2, #3 & #4 Surface	AOC #2 Sub-Surface Grids	AOC #2 Sub-Surface Grids	AOC #3 Sub-Surface Grids	AOC #4 Sub-Surface Grids	DGM Grids AOC #1, #2, #3 & #4	BSI Surface / Sub-Surface / DGM - Sub surface
100 %	100 %	100 %	100 %	100 %	100 %	100 %

OPERATIONAL HEAVY EQUIPMENT ON-SITE						
Dump Truck	Track-hoe	Back-hoe	Bob-Cat	Water Truck	Loader	Other
0	0	0	0	0	0	N/A

NON-OPERATIONAL HEAVY EQUIPMENT						
Dump Truck	Bulldozer	Back-hoe	Bob-Cat	Water Truck	Loader	Other
0	0	0	0	0	0	N/A

COMMENTS:

N/A

INSTRUMENTATION:

Schonstedt(s): **Assigned**

Model	Serial No.	Operational	Condition	Passed ITP	Operator
GA-52Cx	174376	Yes	Good	Yes	B. Thompson / Team #1
GA-52Cx	176076	Yes	Good	Yes	J. Black / Team #1
GA-52Cx	263720	Yes	Good	Yes	S. Kahakua / Team #1
GA-52Cx	177802	Yes	Good	Yes	M. Donaldson / Team #2
GA-52Cx	206568	Yes	Good	Yes	J. DeHerrera / Team #2
GA-52Cx	206574	Yes	Good	Yes	P. Hui / Team #2
GA-52Cx	192045	Yes	Good	Yes	Spare
GA-52Cx	177805	Yes	Good	Yes	D. Heeks / UXOQCS
GA-52Cx	206573	Yes	Good	Yes	R. Rice / UXOQC Asst.

Schonstedt(s): **Unserviceable**

Model	Serial No.	Operational	Condition	Passed ITP	Note
N/A					

COMMENTS:

N/A

WEEKLY EXPLOSIVES USAGE:

WEEK DAY	Explosives		Blasting caps		Tube / Cord		Other	
	Boosters	Perforators	Elect Caps	Non-Elect Caps	Non-EL	Det Cord 80 grain	Time Fuse	Other
Sunday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Monday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tuesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wednesday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thursday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Friday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saturday	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
See Explosive Issue / Usage Form and Magazine Data Cards for Accountability and Signatures.								

WEEKLY INVENTORY:

****NOTE: Per Final Work Plan, Final Explosives Safety Submission, Section 6. Response Actions, Page 6-4, Paragraph *6.4* MEC and Disposition Process: Donaldson Enterprise Inc. (DEI) provides explosives delivery and blaster services, as they have personnel with the necessary Hawaii Blasters Permit. (DEI) Makes one Explosives delivery each week so that any UXO items discovered during the field activities can be destroyed at the end of the work week.**

WEEKLY DETONATION POINTS:

Detonation Point	GPS (X)	GPS (Y)	Area Cleared of Post Blast Residue
(BIP):			
(BIP):			
(BIP):			
Consolidation Point(s):			

COMMENTS ON DEMOLITION OPERATIONS:

N/A

SAFETY: Reported Work Related Injuries/Illness On-Site

WEEK DAY	USAE						Sub-Contractor						Total					
	LWD		Restricted		Other		LWD		Restricted		Other		L		R		O	
	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL	INJ	ILL
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wednesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Friday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saturday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
See Individual Accident / Incident Reports for Specific Information.																		

COMMENTS:

N/A

DOWN TIME:

WEEK DAY	Time		Total Hours	Remarks
	From	To		
Sunday	N/A		0	N/A
See Operations Reports / Logs for Specific Information.				

GENERAL OBSERVATIONS:

Team #1 and Team #2 worked on Vegetation Removal in AOC #5 - moved scrap to area for final processing / Cleaned Up all materials introduced during site operations / Processed all MD.

Wil Chee Planning Soil Sample Collection for background on site Wednesday 05MAY2010. (All Soil Samples completed)

Helicopter was provided for MD / Scrap lifts on site Wednesday & Thursday 05May - 06MAY2010. (All MD Removed)

QC placed seeds as required for DGM operations / Reviewed MD Collection / Worked with SUXOS on final Inspection of collected MD and sealed material in (15) drums.

Control Points Survey was on site - Established controls & recorded points - Surveyed in grid corners AOC #3, #2, #1, & #5 Transects, and surveyed in the Instrument Test Strip. (All Survey requirements completed)

CLIENT/CUSTOMER, REGULATORY DIRECTIVES OR CHANGES TO OPERATIONS:

N/A

LESSONS LEARNED:

Safety Training / Briefs on - Work Plan, APP - SSHP, AHAs, MSDS / Medical first aid for Scrapes and Scratches / Vehicle Safety / Ordnance I.D.& Safe Handling / Helicopter Safety / New person on site - briefed on the WP, APP - SSHP, AHAs, and Sops. All With general discussion of past experiences and lessons learned.

UXOQCS Signature:

David Heeks

May 3, 2010
09:00 HST, 12:00 PDT and 15:00 EDT

Former Waikane Valley Training Area Remedial Investigation CTO 013
Weekly Quality Control (QC) Meeting Minutes

1. Tom Bernitt, Program QC Manager, chaired the Weekly QC Meeting and called the meeting to order at 09:00 HST.
2. Persons in Attendance:

   Tom Bernitt, Program QC Manager, USAE
   David Heeks, UXOQCS, USAE
   James Walden, UXOQC Manager, USAE (recorder)

3. Summation of work accomplished during the previous week (4/26-30/2010)

   David Heeks:

   - Subsurface investigations completed in AOC #2, #3 and #4
   - DGM survey 63% completed across AOCs
   - Placed blind seed items (BSI) in all subsurface grids.
   - Tracked BSI recovery in AOCs.
   - Observed soil sampling (down-hole borings).
   - Observed MEC disposal on April 29, 2010.

   No quality deficiencies or failures occurred.

4. Projected work during the current week (5/3-7/2010)

   David Heeks:

   - DGM survey will continue in AOCs and along the transect segments to the south of the four AOCs.
   - Teams continue to prepare consolidated scrap piles for movement by helicopter to the pre-designated containerization point.

5. Quality Issues

   None

6. Other Issues

   Personnel departures:

- The UXOQCS will demobilize on May 6, 2010. The UXOSO, Randy Jenkins will assume the duties of the UXOQCS as well for the last week of the project. This will not have an impact on the remainder of the project. The UXOSO has experience in the UXOQCS role; additionally, the project is close to completion and all intrusive tasks will have been accomplished this week.

7. Scheduled next meeting

Next meeting scheduled for Monday 10 May, 15:00 EDT/12:00 PDT/09:00 HST unless pre-empted by a general project meeting.

APPENDIX B

Photographic Documentation

Photo 1
Daily Briefing at the Gathering Point

Photo 2
Worksite Meeting Point

Photo 3
Vegetation Removal

Photo 4
60mm Mortar (HE) found in AOC-02

Photo 5
TNT Demolition Block (1/4 pound) found in AOC-02 (DMM #66 in Figure 3-2)

Photo 6
Munitions Debris in AOC-03

Photo 7
3.5-inch Rocket (Intact Warhead, Practice Fuze, and Expended Motor) Found in AOC-03

Photo 8
3.5 HEAT Rocket Found in AOC-03 (UXO #1 in Figure 3-3)

Photo 9
Consolidation of MPPEH for BIP Operations in AOC-03

Photo 10
M28 HEAT Rifle Grenade, Fuzed found in AOC-03 (UXO #11 in Figure 3-3)

Photo 11
Detonation of M28 HEAT Rifle Grenade in AOC-03 (UXO #11 in Figure 3-3)

Photo 12
Protective Work with Sand Bags During Detonation

Photo 13
Munitions Debris Preparation for Transportation at Processing Area

Photo 14
Helicopter Landing Point

Photo 15
Transport of Munitions Debris to Processing Area by Helicopter

Photo 16
Processing Area

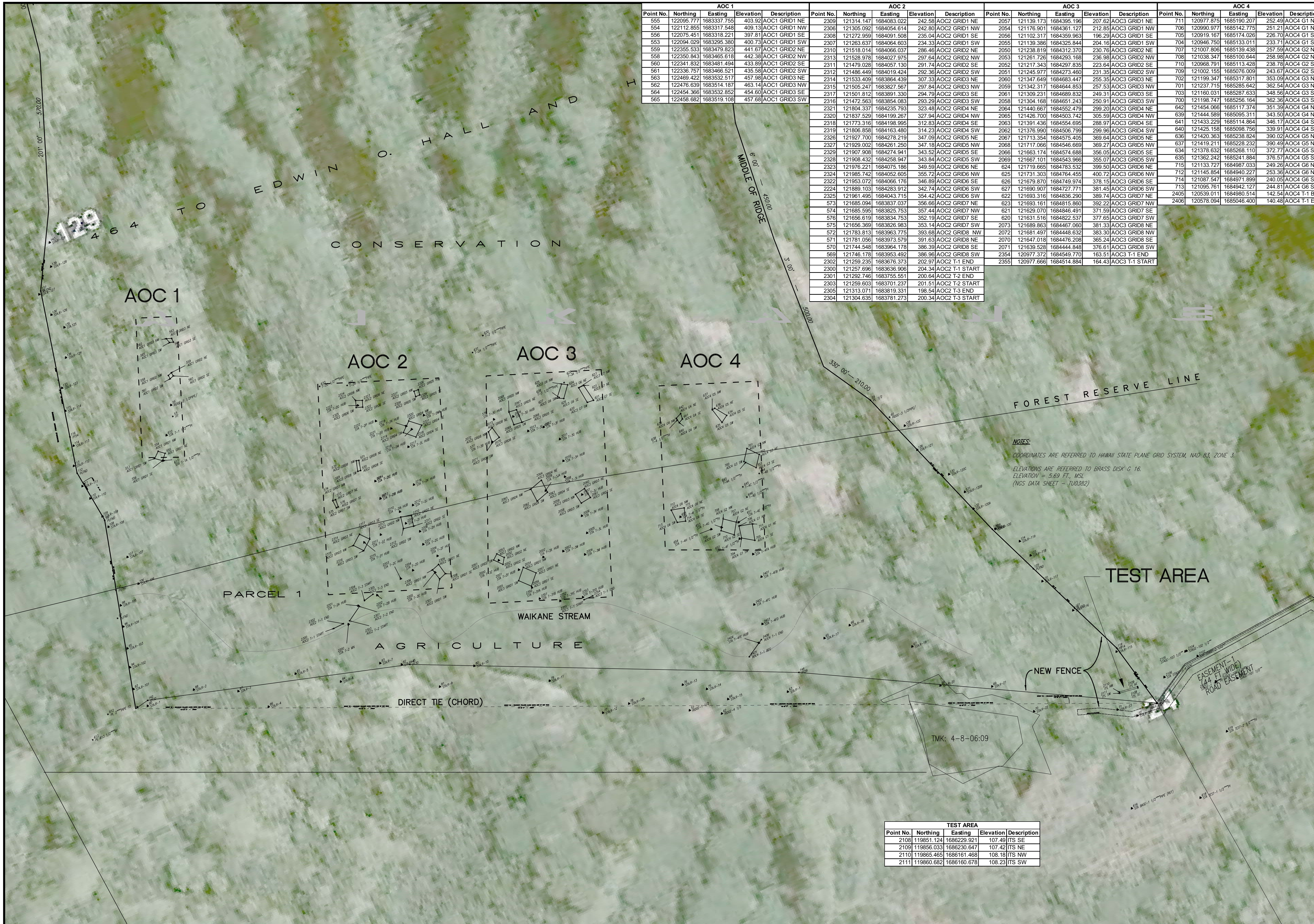
Photo 17
Surface Soil Multi-increment Sampling in AOC-03

Photo 18
Subsurface Soil Discrete Sampling in AOC-04

Photo 19
Sediment Sampling in AOC-05

APPENDIX C

Land Survey Data



AOC 1				
Point No.	Northing	Easting	Elevation	Description
555	122095.777	1683337.755	403.92	AOC1 GRID1 NE
554	122112.855	1683317.548	409.13	AOC1 GRID1 NW
556	122075.451	1683318.221	397.81	AOC1 GRID1 SE
553	122094.029	1683295.380	400.73	AOC1 GRID1 SW
559	122355.533	1683479.823	441.67	AOC1 GRID2 NE
558	122350.843	1683465.618	442.38	AOC1 GRID2 NW
560	122341.832	1683481.494	433.89	AOC1 GRID2 SE
561	122336.757	1683466.521	435.58	AOC1 GRID2 SW
563	122469.422	1683532.517	457.98	AOC1 GRID3 NE
562	122476.639	1683514.187	463.14	AOC1 GRID3 NW
564	122454.366	1683532.852	454.60	AOC1 GRID3 SE
565	122458.682	1683519.108	457.68	AOC1 GRID3 SW

AOC 2				
Point No.	Northing	Easting	Elevation	Description
2309	121314.147	1684083.022	242.58	AOC2 GRID1 NE
2306	121305.092	1684054.614	242.80	AOC2 GRID1 NW
2308	121272.959	1684091.508	235.04	AOC2 GRID1 SE
2307	121263.637	1684064.603	234.33	AOC2 GRID1 SW
2310	121518.014	1684066.037	286.46	AOC2 GRID2 NE
2313	121528.978	1684027.975	297.64	AOC2 GRID2 NW
2311	121479.028	1684057.130	291.74	AOC2 GRID2 SE
2312	121486.449	1684019.424	292.36	AOC2 GRID2 SW
2314	121533.409	1683864.439	307.33	AOC2 GRID3 NE
2315	121505.247	1683827.567	297.84	AOC2 GRID3 NW
2317	121501.812	1683891.330	294.79	AOC2 GRID3 SE
2316	121472.563	1683854.083	293.29	AOC2 GRID3 SW
2321	121804.337	1684235.793	323.48	AOC2 GRID4 NE
2320	121837.529	1684199.267	327.94	AOC2 GRID4 NW
2318	121773.316	1684198.995	312.83	AOC2 GRID4 SE
2319	121806.858	1684163.480	314.23	AOC2 GRID4 SW
2326	121927.700	1684278.219	347.09	AOC2 GRID5 NE
2327	121929.002	1684261.250	347.18	AOC2 GRID5 NW
2329	121907.908	1684274.941	343.52	AOC2 GRID5 SE
2328	121908.432	1684258.947	343.84	AOC2 GRID5 SW
2323	121976.221	1684075.186	349.59	AOC2 GRID6 NE
2324	121985.742	1684052.605	355.72	AOC2 GRID6 NW
2322	121953.072	1684066.176	346.89	AOC2 GRID6 SE
2224	121889.103	1684283.912	342.74	AOC2 GRID6 SW
2325	121961.495	1684043.715	354.42	AOC2 GRID6 SW
573	121685.094	1683837.037	356.66	AOC2 GRID7 NE
574	121685.595	1683825.753	357.44	AOC2 GRID7 NW
576	121656.619	1683834.753	352.19	AOC2 GRID7 SE
575	121656.369	1683826.983	353.14	AOC2 GRID7 SW
572	121783.813	1683963.775	393.68	AOC2 GRID8 NW
571	121781.056	1683973.579	391.63	AOC2 GRID8 NE
570	121744.548	1683964.178	386.39	AOC2 GRID8 SE
569	121746.178	1683953.492	386.96	AOC2 GRID8 SW
2302	121259.235	1683676.373	202.97	AOC2 T-1 END
2300	121257.696	1683636.906	204.34	AOC2 T-1 START
2301	121292.746	1683755.551	200.64	AOC2 T-2 END
2303	121259.603	1683701.237	201.51	AOC2 T-2 START
2305	121313.071	1683819.331	198.54	AOC2 T-3 END
2304	121304.635	1683781.273	200.34	AOC2 T-3 START

AOC 3				
Point No.	Northing	Easting	Elevation	Description
2057	121139.173	1684395.196	207.62	AOC3 GRID1 NE
2054	121176.901	1684361.127	212.85	AOC3 GRID1 NW
2056	121102.317	1684359.963	196.29	AOC3 GRID1 SE
2055	121139.386	1684325.844	204.16	AOC3 GRID1 SW
2050	121238.819	1684312.370	230.76	AOC3 GRID2 NE
2053	121261.726	1684293.168	236.98	AOC3 GRID2 NW
2052	121217.343	1684297.835	223.64	AOC3 GRID2 SE
2051	121245.977	1684273.460	231.35	AOC3 GRID2 SW
2060	121347.649	1684683.447	255.35	AOC3 GRID3 NE
2059	121342.317	1684644.853	257.53	AOC3 GRID3 NW
2061	121309.231	1684689.832	249.31	AOC3 GRID3 SE
2058	121304.168	1684651.243	250.91	AOC3 GRID3 SW
2064	121440.667	1684552.479	299.20	AOC3 GRID4 NE
2065	121426.700	1684503.742	305.59	AOC3 GRID4 NW
2063	121391.436	1684554.695	288.97	AOC3 GRID4 SE
2062	121376.990	1684506.799	299.96	AOC3 GRID4 SW
2067	121713.354	1684575.405	369.64	AOC3 GRID5 NE
2068	121717.066	1684546.669	369.27	AOC3 GRID5 NW
2066	121663.174	1684574.688	356.05	AOC3 GRID5 SE
2069	121667.101	1684543.966	355.07	AOC3 GRID5 SW
624	121719.665	1684783.532	399.50	AOC3 GRID6 NE
625	121731.303	1684764.455	400.72	AOC3 GRID6 NW
626	121679.870	1684749.974	378.15	AOC3 GRID6 SE
627	121690.907	1684727.771	381.45	AOC3 GRID6 SW
622	121693.316	1684836.290	389.74	AOC3 GRID7 NE
623	121693.161	1684815.860	392.22	AOC3 GRID7 NW
621	121629.070	1684846.491	371.59	AOC3 GRID7 SE
620	121631.516	1684822.537	377.65	AOC3 GRID7 SW
2073	121689.863	1684467.060	381.33	AOC3 GRID8 NE
2072	121681.497	1684448.632	383.30	AOC3 GRID8 NW
2070	121647.018	1684476.208	365.24	AOC3 GRID8 SE
2071	121639.528	1684444.848	376.61	AOC3 GRID8 SW
2354	120977.372	1684549.770	163.51	AOC3 T-1 END
2355	120977.666	1684514.884	164.43	AOC3 T-1 START

AOC 4				
Point No.	Northing	Easting	Elevation	Description
711	120977.875	1685190.207	252.49	AOC4 G1 NE
706	120990.977	1685142.775	251.21	AOC4 G1 NW
705	120919.167	1685174.026	226.70	AOC4 G1 SE
704	120946.750	1685133.011	233.71	AOC4 G1 SW
707	121007.806	1685139.438	257.59	AOC4 G2 NE
708	121038.347	1685100.644	258.98	AOC4 G2 NW
710	120968.791	1685113.428	238.78	AOC4 G2 SE
709	121002.155	1685076.009	243.67	AOC4 G2 SW
702	121199.347	1685317.801	353.09	AOC4 G3 NE
701	121237.715	1685285.642	362.54	AOC4 G3 NW
703	121160.031	1685287.633	348.56	AOC4 G3 SE
700	121198.747	1685256.164	362.36	AOC4 G3 SW
642	121454.066	1685117.374	351.39	AOC4 G4 NE
639	121444.589	1685095.311	343.50	AOC4 G4 NW
641	121433.229	1685114.864	346.17	AOC4 G4 SE
640	121425.158	1685098.756	339.91	AOC4 G4 SW
636	121420.363	1685238.824	390.02	AOC4 G5 NE
637	121419.211	1685228.232	390.49	AOC4 G5 NW
634	121378.632	1685268.110	372.77	AOC4 G5 SE
635	121362.242	1685241.884	376.57	AOC4 G5 SW
715	121133.727	1684987.033	249.26	AOC4 G6 NE
712	121145.854	1684940.227	253.36	AOC4 G6 NW
714	121087.547	1684971.899	240.05	AOC4 G6 SE
713	121095.761	1684942.127	244.81	AOC4 G6 SW
2405	120539.011	1684980.514	142.54	AOC4 T-1 BEG
2406	120578.094	1685046.400	140.48	AOC4 T-1 END

TEST AREA				
Point No.	Northing	Easting	Elevation	Description
2108	119851.124	1686229.921	107.49	ITS SE
2109	119856.033	1686230.647	107.42	ITS NE
2110	119865.465	1686161.468	108.18	ITS NW
2111	119860.682	1686160.678	108.23	ITS SW

REV. ADVANCE

PLOTTED: MAY 14, 2010

CONTROLPOINT SURVEYING, INC.
1150 SOUTH KING STREET, SUITE 1200
HONOLULU, HAWAII 96814

SURVEY MAP

GRID SURVEY REMOVAL ACTION ACTIVITIES AT THE FORMER WAIKANE VALLEY TRAINING AREA

KOOLAUPOKO, OAHU, HAWAII

SCALE : NOT TO SCALE
TAX MAP KEY : 4-8-014: POR. 006
DATE : APRIL 26, 2010
DRAFTSMAN : KTN
DRAWING : 10083.DWG
JOB NO. : 10083
FIELD BOOK : 3068
FLD WORK : EP
FLD. CHK. : NA

APPENDIX D

Munitions Disposal Documentation

TIMBERLINE
Environmental Services

Certificate of Destruction

Releasing Generator USA Environmental

Gross Weight 8,080 lbs

[I certify that the items/assets listed were demilitarized in accordance with guidelines in DoD 4160.21-M-1 and have been smelted and are only identifiable by their basic content.]

COD # 051810 **Date** 5/25/10

Name Terry Northcutt **Title** COO

Signature

TES Inc. 29925 Hwy 108, Cold Springs, CA 95335 209-965-3118 caoffice@timberlineenvsv.com

On May 18, 2010, the contents of sealed containers:
00001, Seal ID # 136296
00002, Seal ID # 136294
00003, Seal ID # 136298
00004, Seal ID # 136295
00005, Seal ID # 136291
00006, Seal ID # 184191
00007, Seal ID # 184198
00008, Seal ID # 184190
00009, Seal ID # 184199
00010, Seal ID # 184193
00011, Seal ID # 184192
00012, Seal ID # 857166
00013, Seal ID # 857168
00014, Seal ID # 857167
00015, Seal ID # 857165
were received from USA Environmental, Inc., Waikane Valley Impact Area, MCB Kanehoe, HI project site. Timberline Environmental Services, Inc. (TES) has reviewed the provided supporting documentation and chain of custody, signed for the sealed containers and agree that no explosive hazards were received.

The contents of the sealed container are to be processed as per DoD guidelines 4160-21-M-1, and will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.

Terry Northcutt
TES Inc.

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 TOTAL PRICE (DOLLARS / CTS)	
2 SHIP FROM	
3 SHIP TO	
4 MARK FOR	
5 DOC DATE	
6 NMFC	
7 FRT RATE	
8 TYPE CARGO	
9 PS	
10 QTY REC'D	
11 UP	
12 UNIT WEIGHT	
13 UNIT CUBE	
14 UFC	
15 SL	
16 FREIGHT CLASSIFICATION NOMENCLATURE	
17 ITEM NOMENCLATURE	
18 TY CONT	
19 NO CONT	
20 TOTAL WEIGHT	
21 TOTAL CUBE	
22 RECEIVED BY	
23 DATE RECEIVED	
24 DOCUMENT NUMBER & SUFFIX (30-44)	
25 NATIONAL STOCK NO. & ADD (8-22)	
26 RIC (4-6), UI (23-24), QTY (25-29), CON CODE (71), DIST (55-56), UP (74-80)	
27 ADDITIONAL DATA	

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00001 Seal ID No.: 136296

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief. are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

Verify By: Randall Jenkins

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Randall Jenkins Date: 5-11-10
~~Rep USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE (DOLLARS / CTS)	2 SHIP FROM	3 SHIP TO
UNIT PRICE (DOLLARS / CTS)	4 MARK FOR	
5 DOC DATE	6 NMFC	7 FRT RATE
8 TYPE CARGO	9 PS	
10 QTY REC'D	11 UP	12 UNIT WEIGHT
13 UNIT CUBE	14 UFC	15 SL
16 FREIGHT CLASSIFICATION NOMENCLATURE		
17 ITEM NOMENCLATURE		
18 TY CONT	19 NO CONT	20 TOTAL WEIGHT
21 TOTAL CUBE		
22 RECEIVED BY	23 DATE RECEIVED	

24 DOCUMENT NUMBER & SUFFIX (30-44)

25 NATIONAL STOCK NO. & ADD (8-22)

26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27 ADDITIONAL DATA

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00002 Seal ID No.: 136294

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

Verify By: Randall Jenkins

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Randall Jenkins Date: 5-11-10
Res ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE (DOLLARS / CTS)	
2 SHIP FROM	3 SHIP TO
4 MARK FOR	
UNIT PRICE (DOLLARS / CTS)	
5 DOC DATE	6 NMFC
7 FRT RATE	8 TYPE CARGO
9 PS	
10 QTY REC'D	11 UP
12 UNIT WEIGHT	13 UNIT CUBE
14 UFC	15 SL
16 FREIGHT CLASSIFICATION NOMENCLATURE	
17 ITEM NOMENCLATURE	
18 TY CONT	19 NO CONT
20 TOTAL WEIGHT	21 TOTAL CUBE
22 RECEIVED BY	23 DATE RECEIVED

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00003 Seal ID No.: 136298

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief. are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

[signature] Date: 5/11/10
Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

[signature] Date: 5-11-10
~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

27 ADDITIONAL DATA

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE — DOLLARS — CTS

2 SHIP FROM

3 SHIP TO

4 MARK FOR

UNIT PRICE — DOLLARS — CTS

5 DOC DATE | 6 NMFC | 7 FRT RATE | 8 TYPE CARGO | 9 PS

10 QTY. REC'D | 11 UP | 12 UNIT WEIGHT | 13 UNIT CUBE | 14 UFC | 15 SL

16 FREIGHT CLASSIFICATION NOMENCLATURE

17 ITEM NOMENCLATURE

18 TY CONT | 19 NO CONT | 20 TOTAL WEIGHT | 21 TOTAL CUBE

22 RECEIVED BY | 23 DATE RECEIVED

24 DOCUMENT NUMBER & SUFFIX (30-44)

25 NATIONAL STOCK NO. & ADD (8-22)

26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27 ADDITIONAL DATA

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00004 Seal ID No.: 136295

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief. are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

Verify By: Randall Jenkins

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Randall Jenkins Date: 5-11-10
~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE | DOLLARS | CTS
UNIT PRICE | DOLLARS | CTS
2 SHIP FROM
3 SHIP TO
4 MARK FOR
5 DOC DATE | 6 NMFC | 7 FRT RATE | 8 TYPE CARGO | 9 PS
10 QTY REC'D | 11 UP | 12 UNIT WEIGHT | 13 UNIT CUBE | 14 UFC | 15 SL
16 FREIGHT CLASSIFICATION NOMENCLATURE
17 ITEM NOMENCLATURE
18 TY CONT | 19 NO CONT | 20 TOTAL WEIGHT | 21 TOTAL CUBE
22 RECEIVED BY | 23 DATE RECEIVED

24 DOCUMENT NUMBER & SUFFIX (30-44)
25 NATIONAL STOCK NO. & ADD (8-22)
26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)
27 ADDITIONAL DATA

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00005 Seal ID No.: 136291

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief. are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

Verify By: Randall Jenkins

[signature] Date: 5/11/10
Senior UXO Supervisor / Team Leader

[signature] Date: 5-11-10
RO ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00006 Seal ID No.: 184191

Site Address: WAIKANE VALLEY IMPACT AREA

MCB KANEHOE, HI

Site Telephone No.: N/A

(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

David Wilson Date: 5/11/10

Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

Randall Jenkins Date: 5-11-10

~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00007 Seal ID No.: 184198

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

David Wilson Date: 5/11/10

Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

Randall Jenkins Date: 5-11-10

~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE | DOLLARS | CTS
2 SHIP FROM
3 SHIP TO
4 MARK FOR
UNIT PRICE | DOLLARS | CTS
5 DOC DATE | 6 NMFC | 7 FRT RATE | 8 TYPE CARGO | 9 PS
10 QTY REC'D | 11 UP | 12 UNIT WEIGHT | 13 UNIT CUBE | 14 UFC | 15 SL
16 FREIGHT CLASSIFICATION NOMENCLATURE
17 ITEM NOMENCLATURE
18 TY CONT | 19 NO CONT | 20 TOTAL WEIGHT | 21 TOTAL CUBE
22 RECEIVED BY | 23 DATE RECEIVED

24 DOCUMENT NUMBER & SUFFIX (30-44)
25 NATIONAL STOCK NO. & ADD (8-22)
26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)
27 ADDITIONAL DATA

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00008 Seal ID No.: 184190

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

Randall Jenkins Date: 5-11-10
~~USACE~~ RGS OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

DI / DOC ID	RI FROM	M&S	SER / DIS	QUANTITY	SUPPLEMENTARY ADDRESS	SIG	FUND	DISTRIBUTION	PROJECT	PRI	REQ'D DEL DATE	ADV	RI	O/P	COND / MGT	UNIT PRICE	1. TOTAL PRICE	2. SHIP FROM	3. SHIP TO
																DOLLARS / CTS	DOLLARS / CTS	4. MARK FOR	

24. DOCUMENT NUMBER & SUFFIX (30-44)

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00009 Seal ID No.: 184199

25. NATIONAL STOCK NO. & ADD (8-22)

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS
10. QTY. REC'D	11. UP / 12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL
16. FREIGHT CLASSIFICATION NOMENCLATURE				
17. ITEM NOMENCLATURE				
18. TY CONT	19. NO. CONT	20. TOTAL WEIGHT	21. TOTAL CUBE	
22. RECEIVED BY			23. DATE RECEIVED	

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

27. ADDITIONAL DATA

Certify By: DAVID WILSON

Verify By: Randall Jenkins

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Randall Jenkins Date: 5-11-10
RCJ ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE — DOLLARS | CTS
2 SHIP FROM
3 SHIP TO
4 MARK FOR
UNIT PRICE — DOLLARS | CTS
5 DOC DATE | 6 NMFC | 7 FRT RATE | 8 TYPE CARGO | 9 PS
10 QTY REC'D | 11 UP | 12 UNIT WEIGHT | 13 UNIT CUBE | 14 UFC | 15 SL
16 FREIGHT CLASSIFICATION NOMENCLATURE
17 ITEM NOMENCLATURE
18 TY CONT | 19 NO CONT | 20 TOTAL WEIGHT | 21 TOTAL CUBE
22 RECEIVED BY | 23 DATE RECEIVED

24 DOCUMENT NUMBER & SUFFIX (30-44)
25 NATIONAL STOCK NO. & ADD (8-22)
26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)
27 ADDITIONAL DATA

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00010 Seal ID No.: 184193

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief. are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

Randall Jenkins Date: 5-11-10
~~RES~~ ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE (DOLLARS / CTS)	2 SHIP FROM	3 SHIP TO
UNIT PRICE (DOLLARS / CTS)	4 MARK FOR	
5 DOC DATE	6 NMFC	7 FRT RATE
8 TYPE CARGO	9 PS	
10 QTY REC'D	11 UP	12 UNIT WEIGHT
13 UNIT CUBE	14 UFC	15 SL
16 FREIGHT CLASSIFICATION NOMENCLATURE		
17 ITEM NOMENCLATURE		
18 TY CONT	19 NO CONT	20 TOTAL WEIGHT
21 TOTAL CUBE		
22 RECEIVED BY	23 DATE RECEIVED	

24 DOCUMENT NUMBER & SUFFIX (30-44)

25 NATIONAL STOCK NO. & ADD (8-22)

26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27 ADDITIONAL DATA

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00011 Seal ID No.: 184192

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief. are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

Verify By: Randall Jenkins

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Randall Jenkins Date: 5-11-10
RES ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00012 Seal ID No.: 857166

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

Randall Jenkins Date: 5-11-10
ROS ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

DI OC	RI FROM	M&S	UI	QUANTITY	SUPPLEMENTARY ADDRESS	SIG	FUND	DISTRIBUTION	PROJECT	PR	REQ DEL DATE	ADV	RI	UM	1 TOTAL PRICE	2 SHIP FROM	3 SHIP TO
															UNIT PRICE (DOLLARS, CTS) / DOLLARS, CTS	4 MARK FOR	

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00013 Seal ID No.: 857168

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

5 DOC DATE	6 NMFC	7 FRT RATE	8 TYPE CARGO	9 PS
10 QTY REC'D	11 UP / 12 UNIT WEIGHT	13 UNIT CUBE	14 UFC	15 SL
16 FREIGHT CLASSIFICATION NOMENCLATURE				
17 ITEM NOMENCLATURE				
18 TY CONT / 19 NO CONT	20 TOTAL WEIGHT	21 TOTAL CUBE		
22 RECEIVED BY		23 DATE RECEIVED		

24 DOCUMENT NUMBER & SUFFIX (30-44)
25 NATIONAL STOCK NO. & ADD (8-22)
26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)
27 ADDITIONAL DATA

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

David Wilson Date: 5/11/10
Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

Randall Jenkins Date: 5-11-10
RS ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE | 2 SHIP FROM | 3 SHIP TO | 4 MARK FOR

UNIT PRICE | DOLLARS | CTS

5 DOC DATE | 6 NMFC | 7 FRT RATE | 8 TYPE CARGO | 9 PS

10 QTY REC'D | 11 UP | 12 UNIT WEIGHT | 13 UNIT CUBE | 14 UFC | 15 SL

16 FREIGHT CLASSIFICATION NOMENCLATURE

17 ITEM NOMENCLATURE

18 TY CONT | 19 NO CONT | 20 TOTAL WEIGHT | 21 TOTAL CUBE

22 RECEIVED BY | 23 DATE RECEIVED

24 DOCUMENT NUMBER & SUFFIX (30-44)

25 NATIONAL STOCK NO. & ADD (8-22)

26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27 ADDITIONAL DATA

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00014 Seal ID No.: 857167

Site Address: WAIKANE VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

David Wilson Date 5/11/10
Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

Randall Jenkins Date: 5-11-10
RS ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 TOTAL PRICE		2 SHIP FROM	3 SHIP TO
DOLLARS	CTS	4 MARK FOR	

UNIT PRICE: DOLLARS | CTS

5 DOC DATE	6 NMFC	7 FRT RATE	8 TYPE CARGO	9 PS
10 QTY REC'D	11 UP	12 UNIT WEIGHT	13 UNIT CUBE	14 UFC	15 SL

16 FREIGHT CLASSIFICATION NOMENCLATURE

17 ITEM NOMENCLATURE

18 TY CONT	19 NO CONT	20 TOTAL WEIGHT	21 TOTAL CUBE

22 RECEIVED BY	23 DATE RECEIVED

24 DOCUMENT NUMBER & SUFFIX (30-44)

25 NATIONAL STOCK NO. & ADD (8-22)

26 RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27 ADDITIONAL DATA

Basic Material Content: 3.5" & 2.36" rocket parts

Estimate Weight (lbs): 650

Container ID No.: 00015 Seal ID No.: 857165

Site Address: WAIKANG VALLEY IMPACT AREA
MCB KANEHOE, HI

Site Telephone No.: N/A
(SUXOS) 850-866-5803

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief. are inert and/or free of explosives or related materials.

Certify By: DAVID WILSON

David Wilson Date: 5/11/10

Senior UXO Supervisor / Team Leader

Verify By: Randall Jenkins

Randall Jenkins Date: 5-11-10

RJ ~~USACE~~ OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

Reset

APPENDIX E

Digital Geophysical Mapping Results

Appendix E
Digital Geophysical Mapping Results

USA performed Digital Geophysical Mapping (DGM) at portions of the Waikane Valley Impact Area to evaluate the applicability of DGM at this site. The simple answer to this evaluation is no; the severe terrain and heavy vegetation limit access and therefore applicability of DGM.

USA deployed an EM61-MK2A in stretcher mode, positioned with traditional line/station/fiducials. Fiducials were established every 25 feet. Grid corner locations or transect start and end locations, provided by the project professional land surveyor, were used to translate the data into geodetic coordinates. USA surveyed the Instrument Test Strip (ITS) on Tuesday, 27 April 2010, after seeding the ITS centerline with two small Industry Standard Objects (ISOs), as ITS seed # 10 and ITS Seed. These 1" diameter by 4" pipe nipples were used as control seed items in each survey data set. The ITS was surveyed with three overlapping lines (-2.5 ft (-0.762m), 0 ft (0m), and +2.5 ft (+0.762m)) and an offset line to collect dynamic background data. The ITS data was processed and analyzed on-site to establish anomaly selection criteria on Time Gate 2. An anomaly selection threshold of 6.25 mV on Time Gate 2 was based on 5 times the background RMS noise value of 1.2mV. The signal to noise ratio (SNR) statistics were calculated, using a window size of 4, which resulted in a final anomaly selection based on a SNR > 6.25 and a Signal Strength > 5000.

The DGM team, escorted by the UXOQC, mobilized the DGM system to AOC4, AOC3, and AOC2. The accessible portions of grids were set up; including 25-ft fiducials, survey lines marked every 2.5 ft (0.762m), control seed items placed by the project geophysicist, and blind seed items placed by the UXOQC.

Part of AOC4 Grid 2 was surveyed on Tuesday, 27 April 2010. There are 6 anomalies reported. Two are outside the grid, one is the control seed, and one is the Blind seed, one is a known munitions debris object stuck in a tree root, and 1 was a DGM anomaly.

On Wednesday, 28 April 2010, parts of AOC 4 Grid 6, AOC3 Grid6, and AOC3 Grid7 were surveyed. There were 12 anomalies reported in AOC4 Grid 6. Two were the control seed and the blind seed. One was a know MEC item, 2 were outside the grid, leaving 5 DGM anomalies and 2 multiple picks of the same anomaly. In AOC3 Grid 6 there were 15 anomalies reported. Two are the control seed and blind seed items, one is a PLS hub nail, 9 are DGM anomalies, and 3 are multiple picks of the same anomaly. In AOC3 Grid 7 there are 3 reported anomalies; the control seed, the blind seed, and 1 DGM anomaly.

On Thursday, 29 April 2010, parts of AOC3 Grid 8 were surveyed. In AOC3 Grid 8 there were 12 anomalies reported. Two were the control seed and blind seed, one was outside the grid, 5 are DGM anomalies, and 4 are multiple picks of the same anomaly.

Monday, 3 May 2010 was the last survey day. AOC2 Grid 5 and Grid 6 were surveyed, followed by three transects below AOC2 (T1 through T3), one transect below AOC3 (T4), and one transect below AOC4 (T5), each just above Waikane Stream. Each transect was 3.28 ft (1m) wide. T1 was 41 ft (12.5m) long; T2 was 65 ft (19.81m) long, T3 was 40.5 ft (12.34m) long, T4 was 37 ft (11.3m) long, and T5 was 78 ft (23.8m) long. In AOC2 Grid 5 there were three anomalies reported. Two were the control seed and blind seed items, one was a DGM anomaly. In AOC2 Grid 6 there were only two anomalies reported; the control and blind seed items. In AOC2 Transect 1 there were three anomalies reported. These were a PLS hub nail, and the control and blind seed items. There were no anomalies reported in AOC2 Transect 2 or Transect 3. In AOC3 Transect 4, only the control seed and blind seed items were detected. In AOC4 Transect 5, only the control seed and blind seed items were detected.

On Tuesday, 4 May 2010, all transect anomalies were reacquired and intrusively investigated. These resulted in only seed items placed by the UXOQC and by USA's project Geophysicist, and one nail in a hub placed by the PLS.

Results summary:

On the limited portions of this site that are accessible to DGM, there are anomalies remaining in the cleared grids that could be intrusively investigated. The most obvious anomalies are the control seed items and the blind seed items. Several of the anomalies are known munitions debris embedded to tree roots and left in place. In terms of establishing the nature and extent of MEC at this site, DGM proved to be less superior to analog geophysics, simply from the aspect of accessibility and more complete site coverage. The fact that DGM identified additional anomalies that could be investigated supports the understanding that no geophysical system has a 100% detection rate. Since the DGM grid anomalies were not intrusively investigated, it is not possible to know if this additional information would alter the conclusions drawn from the analog geophysics results.

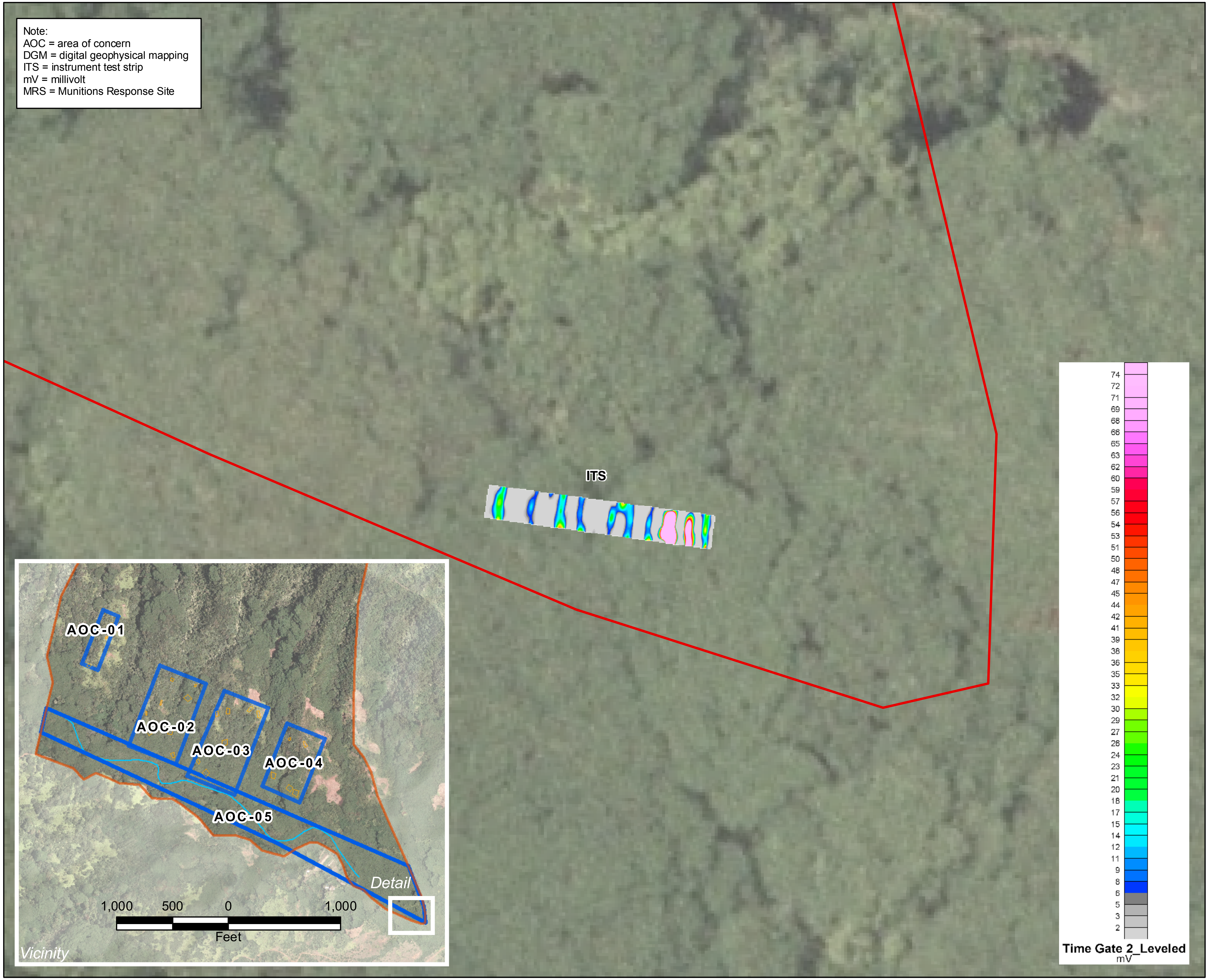
The DGM dig list is provided below. DGM maps are included in the attached pdf and GeoTIFF DGM image files.

Table 1 Waikane DGM Dig List

Target ID	X_SP	Y_SP	Grid_value	Strength	SNR	Comment
ITS_1	1686190	119861.6	12.91	3524.418	21.08914	Multiple of ITS Seed #8
ITS_2	1686183	119859.3	14.97404	999	999	ITS Seed #9
ITS_3	1686184	119862.4	21.86	19586.62	80.01212	Multiple of ITS Seed #9
ITS_4	1686180	119863.3	9.3757477	1772.739	14.48342	DGM Anomaly
ITS_5	1686176	119863.5	9.65	774.9852	7.236219	Multiple of ITS Seed #10
ITS_6	1686174	119858.9	14.782772	5627.306	26.41689	ITS Seed #10
ITS_7	1686165	119864.2	19.830433	13316.2	86.37116	Multiple of ITS Seed #11
ITS_8	1686163	119859.7	29.019011	51670.47	193.4088	ITS Seed #11
ITS_9	1686163	119855.4	28.93	44019.55	164.7705	Multiple of ITS Seed #11

Target ID	X_SP	Y_SP	Grid_value	Strength	SNR	Comment
ITS_10	1686174	119854.2	8.857645	1586.98	9.988432	Multiple of ITS Seed #10
ITS_11	1686183	119852.7	41.12	95074.98	342.3055	Multiple of ITS Seed #9
ITS_12	1686189	119851.8	23.63	23950.79	108.2485	Multiple of ITS Seed #8
ITS_13	1686189	119856.7	10.810861	2718.567	17.76873	ITS Seed #8
ITS_14	1686199	119855.4	23.747501	18213.33	98.57104	ITS Seed #6
ITS_15	1686205	119853.9	14.949874	8277.354	42.62528	ITS Seed #5
ITS_16	1686204	119849.7	18.19	10694.23	50.76405	Multiple of ITS Seed #5
ITS_17	1686211	119848.8	30.41	30394.46	152.8155	Multiple of ITS Seed #4
ITS_18	1686211	119852.5	16.078796	3675.221	34.6977	ITS Seed #4
ITS_19	1686217	119852.8	902.73224	52099030	189991.2	ITS Seed #3
ITS_20	1686224	119851.4	141.1748	1303954	5956.747	ITS Seed #2
ITS_21	1686229	119846.5	41.349285	30816.4	331.4473	Multiple of ITS Seed #1
ITS_22	1686229	119851.2	31.534422	53838.71	264.4285	ITS Seed #1
ITS_23	1686230	119856.6	29.183622	34196.28	137.707	Multiple of ITS Seed #1
ITS_24	1686212	119858.5	7.32	506.3463	6.421442	Multiple of ITS Seed #4
ITS_25	1686203	119859.8	36.57	83886.41	309.9014	DGM Anomaly
AOC2G5_1	1684269	121910.5	41.9	222587.9	432	Blind Seed
AOC2G5_2	1684270	121918.1	134	2197498	4146.7	Control Seed
AOC2G5_3	1684268	121913	25.5	129230.3	300.1	Multiple Pick
AOC2G6_1	1684053	121971.4	94.7	1203943	1235.2	Control Seed
AOC2G6_2	1684055	121977.8	139.8	3352264	3091.8	Blind Seed
AOC2T1_1	1683637	121257.8	8.8	*	*	PLS Hub
AOC2T1_2	1683648	121258.2	131.5	*	*	Control Seed
AOC2T1_3	1683667	121259	9.9	*	*	Blind Seed
AOC3G6_1	1684760	121708.5	20	42808	26.7	Blind Seed
AOC3G6_2	1684755	121705.8	10.3	4571.1	6.3	DGM Anomaly
AOC3G6_3	1684754	121701.6	19.4	15645.3	14	DGM Anomaly
AOC3G6_4	1684751	121701.6	17.3	10270.1	7.7	DGM Anomaly
AOC3G6_5	1684736	121689	687.6	17111014	9455.4	PLS Hub
AOC3G6_6	1684745	121705.8	20.3	28945.4	15.3	DGM Anomaly
AOC3G6_7	1684745	121707	18.1	25637	16.8	Multiple Pick
AOC3G6_8	1684753	121707.9	12.4	6965.6	5.1	DGM Anomaly
AOC3G6_9	1684761	121716.9	459.4	11829845	6422.9	DGM Anomaly
AOC3G6_10	1684766	121718.4	344.3	5207718	2745.3	Control Seed
AOC3G6_11	1684781	121720.2	17.9	7227	8.4	DGM Anomaly
AOC3G6_12	1684769	121713.6	11.7	6836	5	DGM Anomaly
AOC3G6_13	1684770	121712.4	10.1	6327.2	5.8	Multiple Pick
AOC3G6_14	1684770	121707.9	30.4	56267.8	30.3	DGM Anomaly
AOC3G6_15	1684761	121709.7	22.1	42253.4	24.7	Multiple Pick
AOC3G7_1	1684825	121661.7	154.9	1988214	5607.2	Blind Seed

Target ID	X_SP	Y_SP	Grid_value	Strength	SNR	Comment
AOC3G7_2	1684827	121683.3	273.8	4935967	13439.7	Control Seed
AOC3G7_3	1684833	121683.6	19.5	35507.3	99.6	DGM Anomaly
AOC3G8_1	1684451	121652.5	12.5	999	999	Multiple Pick
AOC3G8_2	1684446	121646.8	18.8	999	999	DGM Anomaly
AOC3G8_3	1684448	121645.4	10.2	7547.8	8.9	Multiple Pick
AOC3G8_4	1684455	121645.6	9.6	999	999	DGM Anomaly
AOC3G8_5	1684455	121651.1	48.8	999	999	DGM Anomaly
AOC3G8_6	1684453	121652.7	46.8	167769.5	11.8	DGM Anomaly
AOC3G8_7	1684454	121664.1	21.1	60487.9	12.4	Blind Seed
AOC3G8_8	1684459	121677.1	5.9	999	999	Outside Grid
AOC3G8_9	1684452	121673.1	182.4	4113078	14.9	Control Seed
AOC3G8_10	1684450	121674.7	10.6	24048.9	10.3	Multiple Pick
AOC3G8_11	1684448	121673.6	10	999	999	DGM Anomaly
AOC3G8_12	1684452	121664.2	26.2	85025.3	12.7	Multiple Pick
AOC3T4_1	1684524	120977.6	137.4	*	*	Control Seed
AOC3T4_2	1684540	120977.5	57.5	*	*	Blind Seed
AOC4G2_1	1685109	121010.4	92	424573.3	833.3	Known MD
AOC4G2_2	1685089	120996.9	224.1	2573732	3740.2	Control Seed
AOC4G2_3	1685096	121011.3	15.7	6564.8	14	DGM Anomaly
AOC4G2_4	1685101	121020	141.3	6593429	8745.5	Blind Seed
AOC4G2_5	1685106	121035.3	11.2	3742.9	11.9	Outside Grid
AOC4G2_6	1685109	121036.2	15.5	7131.6	18	Outside Grid
AOC4G6_1	1684969	121106.7	52.5	422060.5	603.3	DGM Anomaly
AOC4G6_2	1684965	121104.3	160.2	2219993	3382.9	Control Seed
AOC4G6_3	1684963	121095.6	52.5	244552.5	455.3	Multiple Pick
AOC4G6_4	1684959	121094.1	111.6	1356536	2124.1	Known MEC
AOC4G6_5	1684959	121102.5	11.6	5929.9	15	DGM Anomaly
AOC4G6_6	1684956	121102.5	12.2	5161.2	13.9	Multiple Pick
AOC4G6_7	1684936	121115.1	162.4	2596005	3972.3	Outside Grid
AOC4G6_8	1684932	121121.1	16.7	24998.5	53.4	Outside Grid
AOC4G6_9	1684949	121125.6	125.3	1839625	2880.5	Blind Seed
AOC4G6_10	1684973	121126.8	37.6	123354.7	190.3	DGM Anomaly
AOC4G6_11	1684980	121130.7	16.4	21080.1	46.4	DGM Anomaly
AOC4G6_12	1684975	121116	76	853084.3	1286.7	DGM Anomaly
AOC4T5_1	1684988	120543.6	115.2	*	*	Control Seed
AOC4T5_2	1685020	120562.4	52.4	*	*	Blind Seed



N

30 15 0 30

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

DGM Map

Instrument Test Strip

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

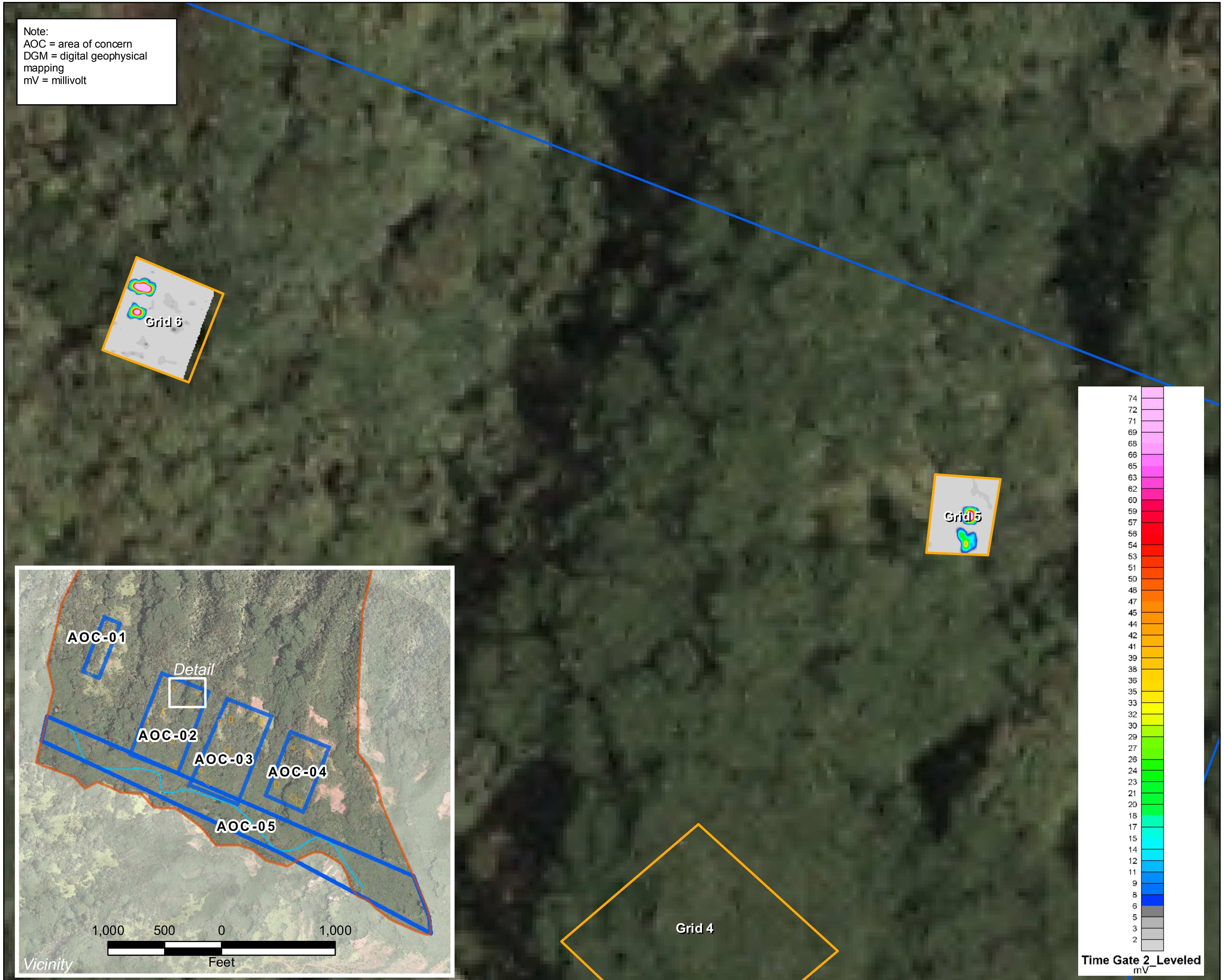
- Waikane Stream
- Intrusive Grids
- Area of Concern
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By:	RM	Scale:	1 inch = 30 feet	Rev:	
Checked By:	SC	Date Drawn:	7-29-10		
Submitted By:	JC	Revision Date:			
	Path:				

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\APPENDIX\ITS DGM MAP.MXD RMANGAN 7/29/2010 13:06:14



N

25 12.5 0 25

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

DGM Map

AOC - 02
Grids 5 & 6
Map

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Waikane Stream
- Intrusive Grids
- Area of Concern
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By:	RM	Scale:	1 inch = 25 feet	Rev:	
Checked By:	SC	Date Drawn:	7-29-10		
Submitted By:	JC	Revision Date:			
	Path:				

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\APPENDIX\AOC 2 GRIDS 5 & 6 DGM MAP.MXD RMANGAN 7/29/2010 10:33:35

N

40 20 0 40

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

DGM Map

AOC - 03
Grids 6, 7, & 8
Map

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Waikane Stream
- Intrusive Grids
- Area of Concern
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By:	RM	Scale:	1 inch = 40 feet	Rev:
Checked By:	SC	Date Drawn:	7-29-10	
Submitted By:	JC	Revision Date:		
	Path:			

N

20 10 0 20

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

DGM Map

AOC - 04
Grids 2 & 6
Map

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

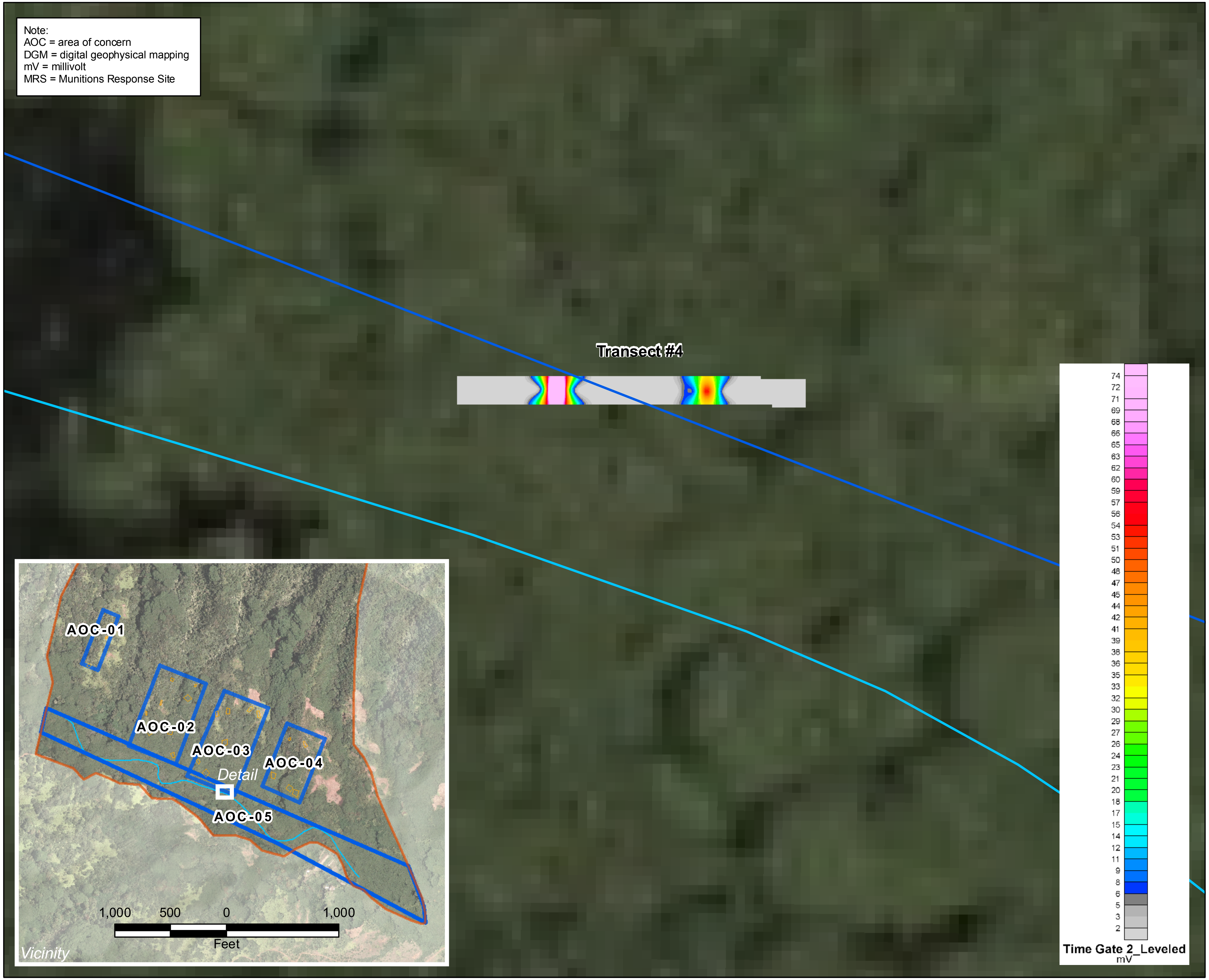
- Waikane Stream
- Intrusive Grids
- Area of Concern
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By:	RM	Scale:	1 inch = 20 feet	Rev:
Checked By:	SC	Date Drawn:	7-29-10	
Submitted By:	JC	Revision Date:		
	Path:			

\\NALA\PROJ\USAENVIRONMENTAL\390801WAIKANEVALLEYR\GIS\MAPFILES\MXD\USAENVIRO_2010JULY\APPENDIX\AOC 4 GRIDS 2 & 6 DGM MAP.MXD RMANGAN 7/29/2010 12:19:26



N

10 5 0 10

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

DGM Map

AOC - 05
Transect T4
Map

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Waikane Stream
- Intrusive Grids
- Area of Concern
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By:	RM	Scale:	1 inch = 10 feet	Rev:
Checked By:	SC	Date Drawn:	7-29-10	
Submitted By:	JC	Revision Date:		
	Path:			

N

10 5 0 10

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

DGM Map

AOC - 05 Transect T5 Map

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

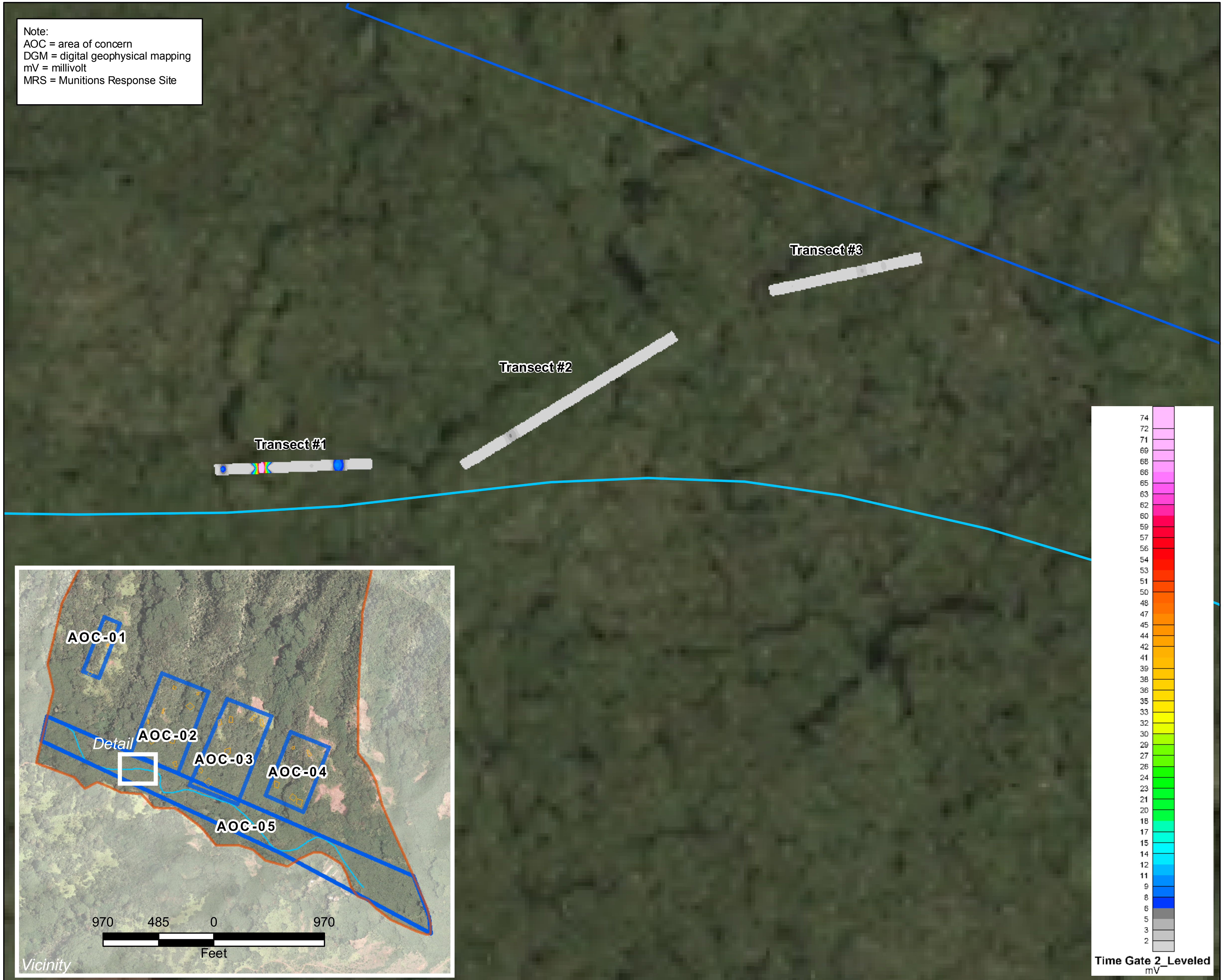
Legend

- Waikane Stream
- Intrusive Grids
- Area of Concern
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By:	RM	Scale:	1 inch = 10 feet	Rev:	
Checked By:	SC	Date Drawn:	7-29-10		
Submitted By:	JC	Revision Date:			
	Path:				



N

25 12.5 0 25

Feet

Data is projected to the State Plane Coordinate System: Hawaii 4 Zone, NAD83, Units in Feet.

DGM Map

AOC - 05
Transects T1, T2, & T3
Map

Waikane Valley Impact Area
Koolaupoko District, O'ahu, Hawai'i

Legend

- Waikane Stream
- Intrusive Grids
- Area of Concern
- Waikane MRS Boundary

USA Environmental, Inc.

NAVFAC Naval Facilities Engineering Command

Drawn By:	RM	Scale:	1 inch = 25 feet	Rev:
Checked By:	SC	Date Drawn:	7-29-10	
Submitted By:	JC	Revision Date:		
	Path:			

APPENDIX F

Data Quality Assessment Report

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Wil Chee Planning, Inc.
1018 Palm Drive
Honolulu, HI 96814
ATTN: Mr. Derek Yasaka

June 14, 2010

SUBJECT: Data Quality Assessment Report for the Remedial Investigation Waikane Valley Impact Area Kaneohe, Oahu, Hawaii CTO 0010

Dear Mr. Yasaka,

Enclosed is the Data Quality Assessment Report for the Remedial Investigation Waikane Valley Impact Area Kaneohe, Oahu, Hawaii CTO 0010

We appreciate this opportunity to support Wil Chee Planning, Inc. in the performance of this project.

Please feel free to call me at (760) 634-0437 if you have any questions.

Sincerely,

Pei Geng for

Stella S. Cuenco
Project Manager/Senior Chemist

DATA QUALITY ASSESSMENT REPORT

REMEDIAL INVESTIGATION
WAIKANE VALLEY IMPACT AREA
KANEOHE, OAHU, HAWAII
CTO 0010

June 14, 2010

Table of Contents

GLOSSARY

CTO	Contract Task Order
DQAR	Data Quality Assessment Report
DOD	Department of Defense
DL	Detection Limit
DUP	Duplicate
EDL	Estimated Detection Limit
ICB/CCB	Initial and Continuing Calibration Blanks
LCS/LCSD	Laboratory Control Sample / Laboratory Control Sample Duplicate
LDC	Laboratory Data Consultants, Inc
LOD	Limit of Detection
LOQ	Limit of Quantitation
MS/MSD	Matrix Spike / Matrix Spike Duplicate
NAVFAC	Naval Facilities Engineering Command
PARCC	Precision, Accuracy, Representativeness, Comparability, Completeness
PQO	Project Quality Objectives
PT	Proficiency Testing sample
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QSM	Quality Systems Manual
RI	Remedial Investigation
RPD	Relative Percent Difference
RRF	Relative Response Factor
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
TRP	Triplicate
WVIA	Waikane Valley Impact Area
%D	Percent Difference
%R	Percent Recovery
%RSD	Percent Relative Standard Deviation
mg/Kg	Milligrams per Kilogram
ug/L	Micrograms per Liter
ug/Kg	Micrograms per Kilogram

1.0 INTRODUCTION

A remedial investigation (RI) was conducted at the Waikane Valley Impact Area (WVIA) located near Kaneohe, Oahu, Hawaii. This part of the investigation included the collection and analyses of 84 environmental and quality control (QC) samples. The analyses were performed by the following methods:

Explosives by United States Environmental Protection Agency (EPA) SW-846 Method 8330
Metals by EPA SW-846 Methods 6010B/7471A

Analytical services were provided by Curtis & Tompkins, Ltd., whom performed analyses on the soil, sediment and water samples. The samples were grouped into sample delivery groups (SDGs) of up to 20 field samples received by the laboratory. The environmental samples are associated with quality assurance and quality control (QA/QC) samples designed to document the data quality of the entire SDG or a sub-group of samples within a SDG. Table I is a cross-reference table listing each sample, analysis, SDG, collection date, laboratory sample number, and matrix. All shaded samples in Table I were reviewed under Full data validation procedures.

Approximately ten percent of the analytical data were validated according to Naval Facilities Engineering Command (NAVFAC) Pacific Full data validation procedures and ninety percent of the analytical data were validated according to NAVFAC Pacific Standard data validation procedures. The analytical data were evaluated for QA/QC based on the *NAVFAC Pacific Environmental Restoration (ER) Program Data Validation Procedures (2007), Department of Defense Quality Systems Manual for Environmental Laboratories, Version 4.1 (DoD 2009)* and *Draft Final Remedial Investigation Munitions Constituents Sampling Analysis Plan (SAP), Munitions Response Sites, Waikane Valley Impact Area, CTO 0010, Kaneohe, HI (February 8, 2010).*

This data quality assessment report (DQAR) summarizes the QA/QC evaluation of the data according to precision, accuracy, representativeness, completeness, and comparability (PARCC) relative to the project quality objectives (PQOs). This report provides a quantitative and qualitative assessment of the data and identifies potential sources of error, uncertainty, and bias that may affect the overall usability.

The DQAR evaluates and summarizes the results of QA/QC data validation for the entire sampling program. Each analytical fraction has a separate section for each of the PARCC criteria. These sections interpret specific QC deviations and their effects on both individual data points and the analyses as a whole. Section 5 presents a summary of the PARCC criteria by comparing quantitative parameters with acceptability criteria defined in the PQOs. Qualitative PARCC criteria are also summarized in this section.

Precision and Accuracy of Environmental Data

Environmental data quality depends on sample collection procedures, analytical methods and instrumentation, documentation, and sample matrix properties. Both sampling procedures and laboratory analyses contain potential sources of uncertainty, error, and/or bias, which affect the overall quality of a measurement. Errors in sample data may result from incomplete equipment decontamination, inappropriate sampling techniques, sample heterogeneity, improper filtering, and improper preservation. The accuracy of analytical results is dependent on selecting appropriate analytical methods, maintaining equipment properly, and complying with QC requirements. The sample matrix also is an important factor in the ability to obtain precise and accurate results within a given media.

Environmental and laboratory QA/QC samples assess the effects of sampling procedures and evaluate laboratory contamination, laboratory performance, and matrix effects. QA/QC samples include: equipment blanks, method blanks, field duplicates, laboratory control sample/laboratory control sample duplicates (LCS/LCSDs), surrogate spikes and matrix spike/matrix spike duplicates (MS/MSDs).

Before conducting the PARCC evaluation, the analytical data were validated according to the NAVFAC procedures, SAP and DoD QSM. Samples not meeting the NAVFAC procedures, SAP and DoD QSM acceptance criteria were qualified with a flag, an abbreviation indicating a deficiency with the data. The following are flags used in data validation.

J Estimated The associated numerical value is an estimated quantity. The analyte was detected but the reported value may not be accurate or precise. The "J" qualification indicates the data fell outside the QC limits, but the exceedance was not sufficient to cause rejection of the data.

R Rejected The data is unusable (the compound or analyte may or may not be present). Use of the "R" qualifier indicates a significant variance from functional guideline acceptance criteria. Either resampling or reanalysis is necessary to determine the presence or absence of the rejected analyte.

U Nondetected Analyses were performed for the compound or analyte, but it was not detected. The "U" designation is also applied to suspected blank contamination. The "U" flag is used to qualify any result detected in an environmental sample at a concentration less than 10 times the value of the concentration in any associated blank for common laboratory contaminants and less than 5 times the concentration in any associated blank for all other contaminants.

UJ Estimated/Nondetected Analyses were performed for the compound or analyte, but it was not detected and the limit of detection (LOD) is an estimated quantity due to poor accuracy or precision. This qualification is also used to flag possible false negative results in the case where low bias in the analytical system is indicated by low calibration response, surrogate, internal standard, or other spike recovery.

Once the data are reviewed and qualified according to the NAVFAC procedures, SAP and DoD QSM, the data set is then evaluated using PARCC criteria. PARCC criteria provide an evaluation of overall data usability. The following is a discussion of PARCC criteria as related to the PQOs.

Precision is a measure of the agreement or reproducibility of analytical results under a given set of conditions. It is a quantity that cannot be measured directly but is calculated from percent recovery data.

Precision is expressed as the relative percent difference (RPD):

$$RPD = (D1-D2)/\{1/2(D1+D2)\} \times 100$$

Where:
D1 and D2 = the reported concentrations for sample and duplicate analyses.

Precision is primarily assessed by calculating a RPD from the percent recoveries of the spiked compounds for each sample in the MS/MSD pair. In the absence of a MS/MSD pair, a laboratory duplicate or LCS/LCSD pair can be analyzed as an alternative means of assessing precision. In some cases, samples from multiple SDGs were within one QC batch and therefore are associated with the same laboratory QC samples. An additional measure of sampling precision was obtained by collecting and analyzing field duplicate samples, which were compared using the RPD result as the evaluation criteria.

MS and MSD samples are field samples spiked by the laboratory with target analytes prior to preparation and analysis. These samples measure the overall efficiency of the analytical method in recovering target analytes from an environmental matrix. A LCS is similar to a MS/MSD sample in that the LCS is spiked with the same target analytes prior to preparation and analysis. However, the LCS is prepared using a controlled interference-free matrix instead of a field sample aliquot. Laboratory reagent water is used to prepare aqueous LCS. Non-aqueous LCSs are prepared using solid media approved by the American Society for Testing and Materials (ASTM) for their homogeneity. The LCS measures laboratory efficiency in recovering target analytes from either a solid or aqueous matrix in the absence of matrix interferences.

Laboratory and field sampling precision are further evaluated by calculating RPDs for field sample duplicate pairs. The sampler collects two field samples at the same location and under identically controlled conditions. The laboratory then analyzes the samples under identical conditions.

An RPD outside the numerical QC limit in either MS/MSD samples or LCS/LCSD indicates imprecision. Imprecision is the variance in the consistency with which the laboratory arrives at a particular reported result. Thus, the actual analyte concentration may be higher or lower than the reported result.

Possible causes of poor precision include sample matrix interference, improper sample collection or handling, inconsistent sample preparation, and poor instrument stability. In some duplicate pairs, results maybe reported in either the primary or duplicate samples at levels below the limit of quantitation (LOQ) or non-detected. Since these values are considered to be estimates, RPD exceedances from these duplicate pairs do not suggest a significant impact on the data quality.

Accuracy is a measure of the agreement of an experimental determination and the true value of the parameter being measured. It is used to identify bias in a given measurement system. Recoveries outside acceptable QC limits may be caused by factors such as instrumentation, analyst error, or matrix interference. Accuracy is assessed through the analysis of MS, MSD, LCS, and samples containing surrogate spikes. In some cases, samples from multiple SDGs were within one QC batch and therefore are associated with the same laboratory QC samples. Surrogate spikes are either isotopically labeled compounds or compounds that are not typically detected in the samples. Surrogate spikes are added to every blank, environmental sample, MS/MSD, LCS/LCSD and standard, for all applicable organic analyses. Accuracy of inorganic analyses is determined using the percent recoveries of MS and LCS analyses.

Percent recovery (%R) is calculated using the following equation:

$$\%R = (A-B)/C \times 100$$

Where:
A = measured concentration in the spiked sample
B = measured concentration of the spike compound in the unspiked sample
C = concentration of the spike

The percent recovery of each analyte spiked in MS/MSD samples, LCS, and surrogate compounds added to environmental samples is evaluated against the acceptance criteria specified by the previously noted documents. Spike recoveries outside the acceptable QC accuracy limits provide an indication of bias, where the reported data may overestimate or underestimate the actual concentration of compounds detected or LODs reported for environmental samples.

Representativeness is a qualitative parameter that expresses the degree to which the sample data are characteristic of a population and is evaluated by reviewing the QC results of blank samples and holding times. Positive detects of compounds in the blank samples identify compounds that may have been introduced into the samples during sample collection, transport, preparation, or analysis. The QA/QC blanks collected and analyzed are method blanks, calibration blanks and equipment blanks.

A method blank is a laboratory grade water or solid matrix that contains the method reagents and has undergone the same preparation and analysis as the environmental samples. The method blank provides a measure of the combined contamination derived from the laboratory source water, glassware, instruments, reagents, and sample preparation steps. Method blanks are prepared for each sample of a similar matrix extracted by the same method at a similar concentration level.

For inorganic analyses, initial and continuing calibration blanks (ICB/CCB) consist of acidified laboratory grade water, which are injected at the beginning and at a regular frequency during each 12 - hour sample analysis run. These blanks estimate residual contaminants from the previous sample or standards analysis and measure baseline shifts that commonly occur in emission and absorption spectroscopy.

Equipment blanks consist of analyte-free water poured over or through the sample collection equipment. The water is collected in a sample container for laboratory analysis. These blanks are collected after the sampling equipment is decontaminated and measure efficiency of the decontamination procedure. Equipment blanks were collected and analyzed for all target analytes.

Contaminants found in both the environmental sample and a blank sample are assumed to be laboratory artifacts if the concentration in the environmental sample is less than 5 times the blank value for laboratory contaminants.

Holding times are evaluated to assure that the sample integrity is intact for accurate sample preparation and analysis. Holding times will be specific for each method and matrix analyzed. Holding time exceedances can cause loss of sample constituents due to biodegradation, precipitation, volatization, and chemical degradation.

Comparability is a qualitative expression of the confidence with which one data set may be compared to another. It provides an assessment of the equivalence of the analytical results to data obtained from other analyses. It is important that data sets be comparable if they are used in conjunction with other data sets. The factors affecting comparability include the following: sample collection and handling techniques, matrix type, and analytical method. If these aspects of sampling and analysis are carried out according to standard analytical procedures, the data are considered comparable. Comparability is also dependent upon other PARCC criteria, because only when precision, accuracy, and representativeness are known can data sets be compared with confidence.

Completeness is defined as the percentage of acceptable sample results compared to the total number of sample results. Completeness is evaluated to determine if an acceptable amount of usable data were obtained so that a valid scientific site assessment can be completed. Completeness equals the total number of sample results for each fraction minus the total number of rejected sample results divided by the total number of sample results multiplied by 100. As specified in the PQOs, the goal for completeness for target analytes in each analytical fraction is 90 percent.

Percent completeness is calculated using the following equation:

$$\%C = (T - R)/T \times 100$$

Where:
%C = percent completeness
T = total number of sample results
R = total number of rejected sample results

Completeness is also determined by comparing the planned number of samples per method and matrix as specified in the project planning document, with the number determined above.

The following sections present a review of QC data for each analytical method.

2.0 EXPLOSIVES

A total of 23 soil and 5 sediment samples were analyzed for Explosives by EPA SW-846 Method 8330. All Explosives data were assessed to be valid since none of the 327 total results were rejected due to holding time or QC exceedances. This section discusses the QA/QC supporting documentation as defined by the PARCC criteria and evaluated based on the PQOs.

2.1 Precision and Accuracy

2.1.1 Instrument Calibration

Initial and continuing calibration results provide a means of evaluating accuracy within a particular SDG. Relative response factor (RRF), percent relative standard deviation (%RSD), and percent difference (%D) are the three major parameters used to measure the effectiveness of instrument calibration. RRF is a measure of the relative spectral response of an analyte compared to its internal standard. %RSD is an expression of the linearity of instrument response. %D is a comparison of a continuing calibration instrumental response with its initial response. %RSD and %D exceedances suggest routine instrumental anomalies, which typically impact all sample results for the affected compounds.

The %RSDs met the method acceptance criteria of 20 percent or the coefficient of determination (r^2) was ≥ 0.990 in the initial calibration. The %Ds in the initial calibration verification and continuing calibration met the acceptance criteria of 20 percent.

2.1.2 Surrogates

No data were qualified based on surrogate non-conformances. The percent recoveries were evaluated against the acceptance criteria.

2.1.3 MS/MSD Samples

As a result of non-compliant MS/MSD %Rs and RPD, 2 results for 2,4,6-trinitrotoluene in samples WVIA-B-012B and WVIA-B-013B were qualified as detected estimated (J). The details regarding the qualification of results are provided in the data validation reports.

2.1.4 LCS Samples

No data were qualified based on LCS/LCSD non-conformances. The percent recoveries and RPDs were evaluated against the acceptance criteria.

2.1.5 Field Duplicate Samples

The field duplicate samples were evaluated for acceptable precision with RPDs for the compounds. Sample data were not qualified on the basis of field duplicate precision. The field duplicates are presented in detail in the data validation reports.

2.1.6 Proficiency Testing Samples

Proficiency testing (PT) sample were not performed for the sampling event.

2.1.7 Compound Quantitation and Target Identification

All compound quantitation and target identification were found to be acceptable.

2.2 Representativeness

2.2.1 Holding Times

The evaluation of holding times to verify compliance with the method was conducted. All holding times were met.

2.2.2 Blanks

Method blanks were collected and analyzed to evaluate representativeness. The concentration for an individual target compound in the QA/QC blank was used for data qualification.

If contaminants were detected in a blank, corrective actions were made for the chemical analytical data during data validation. The corrective action consisted of amending the laboratory reported results based on the following criteria.

> Results Below or Above the LOQ If a sample result for the blank contaminant was less than the LOQ or greater than the sample LOQ and less than 10 times the blank value for common contaminants or 5 times the blank value for other contaminants, the sample result for the blank contaminant was amended as a non-detect at the concentration reported in the sample results.
>
> No Action If a sample result for the blank contaminant was greater than 10 times the blank value for common contaminants or 5 times the blank value for other contaminants, the result was not amended.

2.2.2.1 Method Blanks

No contaminants were detected in the method blanks for this analysis.

2.3 Comparability

The laboratory used standard analytical methods for all of the analyses. In all cases, the detection limits (DL) attained were at or below the specified LOQs. Target compounds detected below the LOQs flagged (J) by the laboratory should be considered estimated. The comparability of the data is regarded as acceptable.

2.4 Completeness

The completeness level attained for Explosives field samples was 100 percent. This percentage was calculated as the total number of accepted sample results divided by the total number of sample results multiplied by 100.

3.0 METALS

A total of 78 soil, five sediment samples and one water sample were analyzed for metals by EPA SW-846 Method 6010B/7471A. All metals data were assessed to be valid since none of the 358 total results were rejected based on holding time or QC exceedances. This section discusses the QA/QC supporting documentation as defined by the PARCC criteria and evaluated based on the PQOs.

3.1 Precision and Accuracy

3.1.1 Instrument Calibration

Initial and continuing calibration verification results provide a means of evaluating accuracy within a particular SDG. Correlation coefficient (r) and percent recovery (%R) are the two major parameters used to measure the effectiveness of instrument calibration. The correlation coefficient indicates the linearity of the calibration curve. %R is used to verify the on going calibration acceptability of the analytical system. The most critical of the two calibration parameters, r, has the potential to affect data accuracy across a SDG when it is outside the acceptable QC limits. %R exceedances suggest more routine instrumental anomalies, which typically impact all sample results for the affected analytes.

The correlation coefficients in the initial calibrations and percent recoveries in the continuing calibration verifications were within the acceptance criteria of $\geq$ 0.995 and 90-110 percent, respectively.

3.1.2 MS/MSD Samples

As a result of non-compliant MS/MSD %Rs and RPDs, 83 results were qualified as detected estimated (J) or non-detected estimated (UJ). The details regarding the qualification of results are provided in the data validation reports.

3.1.3 LCS Samples

No data were qualified based on LCS/LCSD non-conformances. The percent recoveries and RPDs were evaluated against the acceptance criteria.

3.1.4 ICP Serial Dilution

As a result of non-compliant ICP serial dilution %Ds, 20 results for copper were qualified as detected estimated (J). The details regarding the qualification of results are provided in the data validation reports.

3.1.5 ICP Interference Check Sample

No data were qualified based on ICP interference check non-conformances. The recoveries were evaluated against the acceptance criteria.

3.1.6 Field Duplicate Samples

The field duplicate samples were evaluated for acceptable precision with RPDs for the compounds. Sample data were not qualified on the basis of field duplicate precision. The field duplicates are presented in detail in the data validation reports.

3.1.7 Proficiency Testing Samples

Proficiency testing (PT) sample were not performed for the sampling event.

3.1.8 Sample Result Verification

All sample results were found to be acceptable.

3.2 Representativeness

3.2.1 Holding Times

The evaluation of holding times to verify compliance with the method was conducted. All holding times were met.

3.2.2 Blanks

As previously discussed in Section 2.2.2, method blanks, initial and continuing calibration blanks and equipment blanks were analyzed to evaluate representativeness.

3.2.2.1 Method and Calibration Blanks

No contaminants were detected in the method blanks for this analysis.

3.2.2.2 Equipment Blanks

No data were qualified due to the contaminant detected in the equipment blank for this analysis.

3.3 Comparability

The laboratory used standard analytical methods for all of the analyses. In all cases, the detection limits (DL) attained were at or below the specified LOQs. The comparability of the data is regarded as acceptable.

3.4 Completeness

The completeness level attained for metal field samples was 100 percent. This percentage was calculated as the total number of accepted sample results divided by the total number of sample results multiplied by 100.

4.0 VARIANCES IN ANALYTICAL PERFORMANCE

The laboratory used standard analytical methods for all of the analyses throughout the project. No systematic variances in analytical performance were noted in the case narratives.

5.0 SUMMARY OF PARCC CRITERIA

The validation reports present the PARCC results for all SDGs. Each PARCC criterion is discussed in detail in the following sections.

5.1 Precision and Accuracy

Precision and accuracy were evaluated using data quality indicators such as calibration, surrogates, MS/MSD, LCS, and internal standards. The precision and accuracy of the data set were considered acceptable after integration of qualification of estimated results as noted in Sections 2.1.3, 3.1.2 and 3.1.4.

5.2 Representativeness

All samples for each method and matrix were evaluated for holding time compliance. All samples were associated with a method blank in each individual SDG. The representativeness of the project data is considered acceptable.

5.3 Comparability

Sampling frequency requirements were met in obtaining field duplicates and necessary field blanks. The laboratory used standard analytical methods for their analyses. The analytical results were reported in correct standard units. Holding times, sample preservation, and sample integrity were within QC criteria. The overall comparability is considered acceptable.

5.4 Completeness

Of the 685 total results reported, none were rejected. The completeness for all SDGs is as follows:

Parameter	Total Analytes	No. of Rejects	% Completeness
Explosives	327	0	100
Metals	358	0	100
Total	**685**	**0**	**100**

The completeness percentage based on rejected data met the 90 percent DQO goal.

Table I

Validation Sample Table

SDG#: 219125 **VALIDATION SAMPLE TABLE** **LDC#:** 23220A

Project Name: Waikane RI/FS Parameters/Analytical Method **Project #** UXOA-015

Client ID #	Lab ID #	QC Type	Matrix	Date Collected	(9) Metals (6010B)	Nitro & Nitra. (8330)											
WVIA-B-001A	219125-001		soil	03/25/10	X	X											
WVIA-B-002A	219125-002		soil	03/25/10	X	X											
WVIA-B-001B	219125-003		soil	03/25/10	X	X											
WVIA-B-002B	219125-004		soil	03/25/10	X	X											
WVIA-B-001AMS	219125-001MS	MS	soil	03/25/10	X												
WVIA-B-001AMSD	219125-001MSD	MSD	soil	03/25/10	X												

Shaded cells indicate Full validation (all other cells are Standard validation)
FD = Field Duplicate, EB = Equipment Blank
MS = Matrix Spike, MSD = Matrix Spike Duplicate

SDG#: 219613 **VALIDATION SAMPLE TABLE** **LDC#:** 23220B

Project Name: Waikane RI IFS Parameters/Analytical Method **Project #** UXOA-015

Client ID #	Lab ID #	QC Type	Matrix	Date Collected	(6) Metals (6010B)	Metals (SW846)	Expl. (8330)
WVIA-S-001	219613-001		sediment	04/13/10		X	X
WVIA-S-002	219613-002		sediment	04/13/10		X	X
WVIA-S-003	219613-003	FD1	sediment	04/13/10		X	X
WVIA-S-004	219613-004	FD1	sediment	04/13/10		X	X
WVIA-S-005	219613-005		sediment	04/13/10		X	X
WVIA-B-003A	219613-006		soil	04/15/10	X		X
WVIA-B-004A	219613-007		soil	04/15/10	X		X
WVIA-B-005A	219613-008		soil	04/15/10	X		X
WVIA-B-006A	219613-009	FD2	soil	04/15/10	X		X
WVIA-B-007A	219613-010	FD2	soil	04/15/10	X		X
WVIA-B-008A	219613-011		soil	04/15/10	X		X
WVIA-B-009A	219613-012		soil	04/15/10	X		X
WVIA-B-010A	219613-013		soil	04/15/10	X		X
WVIA-B-011A	219613-014		soil	04/15/10	X		X
WVIA-B-003B	219613-015		soil	04/15/10	X		X
WVIA-B-004B	219613-016		soil	04/15/10	X		X
WVIA-B-005B	219613-017		soil	04/15/10	X		X

Shaded cells indicate Full validation (all other cells are Standard validation)
FD = Field Duplicate, EB = Equipment Blank
MS = Matrix Spike, MSD = Matrix Spike Duplicate

SDG#: 219613

VALIDATION SAMPLE TABLE

LDC#: 23220B

Project Name: Waikane RI IFS

Parameters/Analytical Method

Project # UXOA-015

Client ID #	Lab ID #	QC Type	Matrix	Date Collected	(6) Metals (6010B)	Metals (SW846)	Expl. (8330)
WVIA-B-006B	219613-018		soil	04/15/10	X		X
WVIA-B-008B	219613-019		soil	04/15/10	X		X
WVIA-B-009B	219613-020		soil	04/15/10	X		X
WVIA-B-010B	219613-021		soil	04/15/10	X		X
WVIA-B-011B	219613-022		soil	04/15/10	X		X
WVIA-B-012B	219613-023	FD3	soil	04/15/10	X		X
WVIA-B-013B	219613-024	FD3	soil	04/15/10	X		X
WVIA-S-005MS	219613-005MS	MS	sediment	04/13/10		X	X
WVIA-S-005MSD	219613-005MSD	MSD	sediment	04/13/10		X	X
WVIA-B-012BMS	219613-023MS	MS	soil	04/15/10	X		X
WVIA-B-012BMSD	219613-023MSD	MSD	soil	04/15/10	X		X
WVIA-B-013BMS	219613-024MS	MS	soil	04/15/10	X		X
WVIA-B-013BMSD	219613-024MSD	MSD	soil	04/15/10	X		X

Shaded cells indicate Full validation (all other cells are Standard validation)
FD = Field Duplicate, EB = Equipment Blank
MS = Matrix Spike, MSD = Matrix Spike Duplicate

SDG#: 219771 **VALIDATION SAMPLE TABLE** **LDC#:** 23220C

Project Name: Waikane RI/FS Parameters/Analytical Method **Project #** UXOA-015

Client ID #	Lab ID #	QC Type	Matrix	Date Collected	Pb,Cu (6010B)
WVIA-M-001	219771-001		soil	04/19/10	X
WVIA-M-002	219771-002		soil	04/19/10	X
WVIA-M-003	219771-003		soil	04/19/10	X
WVIA-M-004	219771-004		soil	04/19/10	X
WVIA-M-005	219771-005		soil	04/19/10	X
WVIA-M-006	219771-006		soil	04/19/10	X
WVIA-M-007	219771-007		soil	04/19/10	X
WVIA-M-008	219771-008		soil	04/19/10	X
WVIA-M-009	219771-009		soil	04/19/10	X
WVIA-M-010	219771-010		soil	04/19/10	X
WVIA-M-011	219771-011		soil	04/19/10	X
WVIA-M-012	219771-012		soil	04/19/10	X
WVIA-M-013	219771-013		soil	04/20/10	X
WVIA-M-014	219771-014		soil	04/20/10	X
WVIA-M-015	219771-015		soil	04/20/10	X
WVIA-M-016	219771-016		soil	04/20/10	X
WVIA-M-017	219771-017		soil	04/20/10	X

Shaded cells indicate Full validation (all other cells are Standard validation)
FD = Field Duplicate, EB = Equipment Blank
MS = Matrix Spike, MSD = Matrix Spike Duplicate

SDG#: 219771 **VALIDATION SAMPLE TABLE** **LDC#:** 23220C

Project Name: Waikane RI/FS Parameters/Analytical Method **Project #** UXOA-015

Client ID #	Lab ID #	QC Type	Matrix	Date Collected	Pb,Cu (6010B)												
WVIA-M-018	219771-018		soil	04/20/10	X												
WVIA-M-019	219771-019		soil	04/20/10	X												
WVIA-M-020	219771-020		soil	04/20/10	X												
WVIA-M-021	219771-021		soil	04/20/10	X												
WVIA-M-022	219771-022		soil	04/20/10	X												
WVIA-M-023	219771-023		soil	04/20/10	X												
WVIA-M-024	219771-024		soil	04/20/10	X												
WVIA-M-025	219771-025		soil	04/20/10	X												
WVIA-M-026	219771-026		soil	04/20/10	X												
WVIA-M-027	219771-027		soil	04/20/10	X												
WVIA-M-028	219771-028		soil	04/20/10	X												
WVIA-M-029	219771-029		soil	04/20/10	X												
WVIA-M-030	219771-030		soil	04/20/10	X												
WVIA-M-001MS	219771-001MS	MS	soil	04/19/10	X												
WVIA-M-001MSD	219771-001MSD	MSD	soil	04/19/10	X												
WVIA-M-020MS	219771-020MS	MS	soil	04/20/10	X												
WVIA-M-020MSD	219771-020MSD	MSD	soil	04/20/10	X												

Shaded cells indicate Full validation (all other cells are Standard validation)
FD = Field Duplicate, EB = Equipment Blank
MS = Matrix Spike, MSD = Matrix Spike Duplicate

SDG#: 219803 **VALIDATION SAMPLE TABLE** **LDC#:** 23220D

Project Name: Waikane RI/FS Parameters/Analytical Method **Project #** UXOA-015

Client ID #	Lab ID #	QC Type	Matrix	Date Collected	Metals (SW846)	Pb,Cu (6010B)
WVIA-SS-001	219803-001		soil	04/26/10		X
WVIA-SS-002	219803-002		soil	04/26/10		X
WVIA-SS-003	219803-003		soil	04/26/10		X
WVIA-SS-004	219803-004		soil	04/26/10		X
WVIA-SS-005	219803-005		soil	04/26/10		X
WVIA-SS-006	219803-006		soil	04/26/10		X
WVIA-SS-007	219803-007		soil	04/26/10		X
WVIA-SS-008	219803-008		soil	04/26/10		X
WVIA-SS-009	219803-009		soil	04/26/10		X
WVIA-SS-010	219803-010		soil	04/26/10		X
WVIA-SS-011	219803-011		soil	04/26/10		X
WVIA-SS-012	219803-012	FD1	soil	04/26/10		X
WVIA-SS-013	219803-013	FD1	soil	04/26/10		X
WVIA-SS-014	219803-014		soil	04/26/10		X
WVIA-SS-015	219803-015		soil	04/26/10		X
WVIA-SS-016	219803-016		soil	04/27/10		X
WVIA-SS-017	219803-017		soil	04/27/10		X
WVIA-SS-018	219803-018		soil	04/27/10		X

Shaded cells indicate Full validation (all other cells are Standard validation)
FD = Field Duplicate, EB = Equipment Blank
MS = Matrix Spike, MSD = Matrix Spike Duplicate

SDG#: 219803 **VALIDATION SAMPLE TABLE** **LDC#:** 23220D

Project Name: Waikane RI/FS Parameters/Analytical Method **Project #** UXOA-015

Client ID #	Lab ID #	QC Type	Matrix	Date Collected	Metals (SW846)	Pb,Cu (6010B)											
WVIA-SS-019	219803-019		soil	04/27/10	X												
WVIA-SS-020	219803-020		soil	04/27/10		X											
WVIA-SS-021	219803-021		soil	04/27/10		X											
WVIA-SS-022	219803-022		soil	04/27/10		X											
WVIA-SS-023	219803-023	FD2	soil	04/27/10		X											
WVIA-SS-024	219803-024	FD2	soil	04/27/10		X											
WVIA-SS-025	219803-025	EB	water	04/27/10		X											
WVIA-SS-001MS	219803-001MS	MS	soil	04/26/10		X											
WVIA-SS-001MSD	219803-001MSD	MSD	soil	04/26/10		X											

Shaded cells indicate Full validation (all other cells are Standard validation)
FD = Field Duplicate, EB = Equipment Blank
MS = Matrix Spike, MSD = Matrix Spike Duplicate

SDG#: 220063 **VALIDATION SAMPLE TABLE** **LDC#:** 23220E

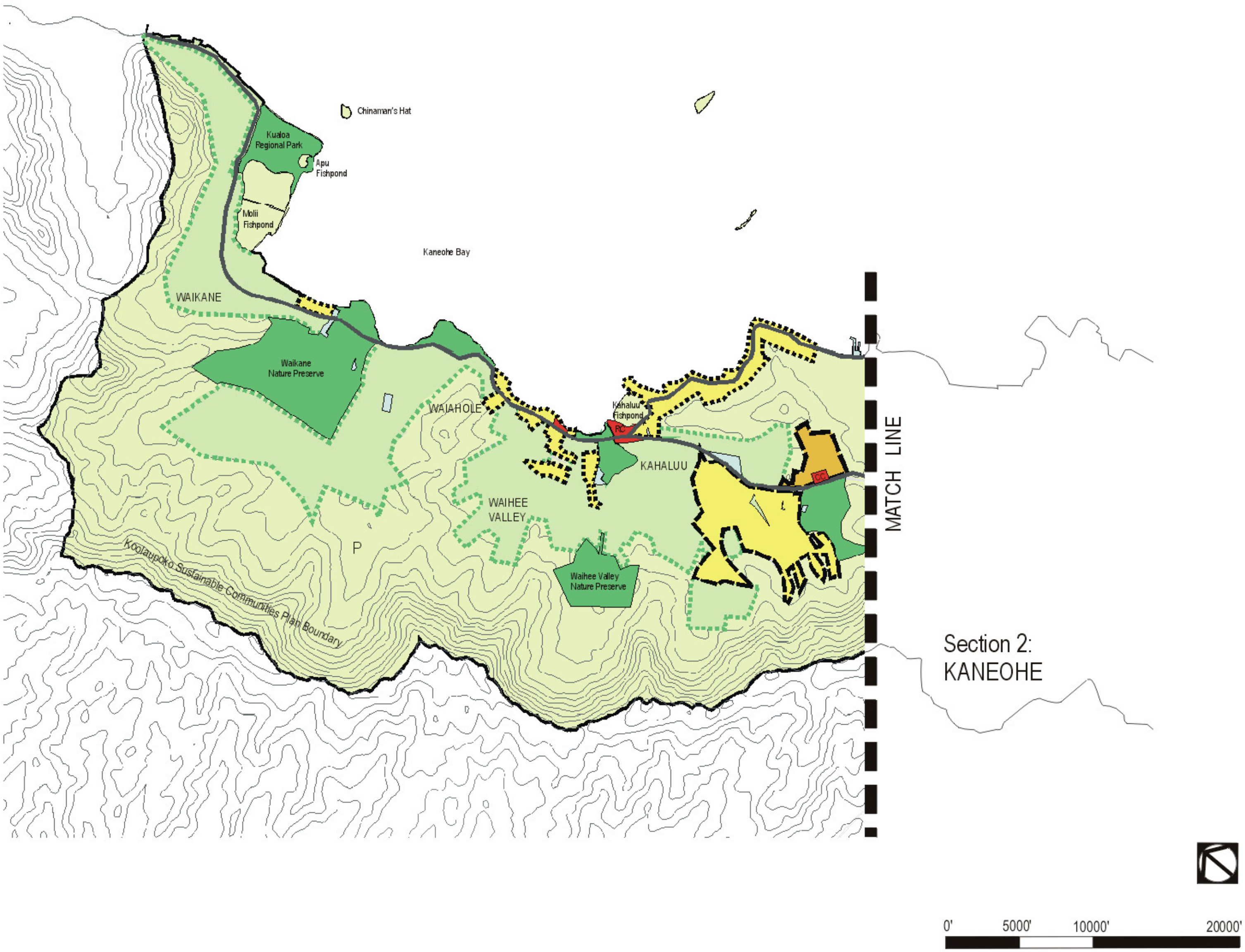
Project Name: Waikane RI/FS Parameters/Analytical Method **Project #** UXOA-015

Client ID #	Lab ID #	QC Type	Matrix	Date Collected	(6) Metals (6010B)												
WVIA-SS-026	220063-001		soil	05/05/10	X												
WVIA-SS-026MS	220063-001MS	MS	soil	05/05/10	X												
WVIA-SS-026MSD	220063-001MSD	MSD	soil	05/05/10	X												

Shaded cells indicate Full validation (all other cells are Standard validation)
FD = Field Duplicate, EB = Equipment Blank
MS = Matrix Spike, MSD = Matrix Spike Duplicate

APPENDIX G

Kahaluu Land Use Map



- P Open Space/Preservation Areas
- Agricultural Areas
- Major Parks, Golf Courses, and Cemeteries, and Nature Preserves
- Medium Density Residential
- Low Density Residential
- Industrial
- Institutional
- Military
- CC Community Commercial Centers
- RC Rural Commercial Centers
- nc Neighborhood Commercial Centers
- TC Regional Town Centers
- Urban Community Boundary
- Rural Community Boundary
- Agriculture/Open Space/Preservation Boundary
- Freeways, Highways, and Major Roads
- High School (State)
- Intermediate School (State)
- Wastewater Treatment Plant

KOOLAUPOKO
SUSTAINABLE COMMUNITIES PLAN

Map A-2; Section 1: Kahaluu

Department of Planning and Permitting
City & County of Honolulu
August 2000

APPENDIX H

Material Safety Data Sheet for Copper

MSDS Number: **C5170** * * * * * *Effective Date:* ***11/21/08*** * * * * * *Supercedes:* ***02/23/06***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

COPPER METAL

1. Product Identification

Synonyms: C.I. 77400; Arwood Copper
CAS No.: 7440-50-8
Molecular Weight: 63.546
Chemical Formula: Cu
Product Codes:
J.T. Baker: 1714, 1720, 1732, 1736
Mallinckrodt: 1733, 4649

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Copper	7440-50-8	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE LIVER AND KIDNEYS. CHRONIC EXPOSURE MAY CAUSE TISSUE DAMAGE.

SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Inhalation of dusts and fumes of metallic copper causes irritation of the upper respiratory tract, congestion of nasal mucous membranes, ulceration and perforation of the nasal septum, and pharyngeal congestion. Inhalation of copper fumes may give rise to metal fume fever (high temperature, metallic taste, nausea, coughing, general weakness, muscle aches, and exhaustion).
Ingestion:
Copper ingestion causes nausea, vomiting, abdominal pain, metallic taste, and diarrhea. Ingestion of large doses may cause stomach and intestine ulceration, jaundice, and kidney and liver damage.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain. Exposure to copper dust may cause a greenish-black skin discoloration.
Eye Contact:
Small copper particles in the eyes may cause irritation, discoloration, and damage.
Chronic Exposure:
Prolonged or repeated exposure to copper can discolor skin and hair and irritate the skin; may cause mild dermatitis, runny nose, and irritation of the mucous membranes. Repeated ingestion may damage the liver and kidneys. Repeated inhalation can cause chronic respiratory disease.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function or pre-existing Wilson's disease may be more susceptible to the effects of this material.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard since the bulk solid does not burn, but very finely divided particles (ultra-fine powder) may burn in air.
Explosion:
Not considered to be an explosion hazard. Reactions with incompatibles may pose an explosion hazard. Liquid copper explodes on contact with water. High concentrations of finely divided copper particles in the air may present an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Avoid exposure to air and moisture. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Copper Dust and Mists, as Cu:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
1 mg/m3 (TWA)
Copper Fume:
- OSHA Permissible Exposure Limit (PEL) -
0.1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m3 (TWA)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece particulate respirator (NIOSH type N100 filters) may be worn for up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids. glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Reddish, metallic solid.
Odor:
Odorless.
Solubility:
Insoluble in water.

Density:
8.94
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
2595C (4703F)
Melting Point:
1083C (1981F)
Vapor Density (Air=1):
Not applicable.
Vapor Pressure (mm Hg):
1 @ 1628C (2962F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Copper becomes dull when exposed to air; on exposure to moist air it gradually converts to the carbonate. On long standing, a white, highly explosive peroxide deposit may form.
Hazardous Decomposition Products:
No information found.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Copper is incompatible with oxidizers, alkalis, acetylene, chlorine plus oxygen difluoride, phosphorus, nitric acid, potassium peroxide, 1-bromo-2-propyne, sulfur plus chlorates. Reacts violently with ammonium nitrate, bromates, iodates, chlorates, ethylene oxide, hydrozoic acid, potassium oxide, dimethyl sulfoxide plus trichloroacetic acid, hydrogen peroxide, sodium peroxide, sodium azide, sulfuric acid, hydrogen sulfide plus air, and lead azide. A potentially explosive reaction occurs with actylenic compounds. Copper ignites on contact with chlorine, fluorine (above 121C), chlorine trifluoride, and hydrazinum nitrate (above 70C). An incandescent reaction occurs with potassium dioxide.
Conditions to Avoid:
Incompatibles and prolonged exposure to air and moisture.

---

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure. Investigated as a tumorigen and a reproductive effector.

--------\Cancer Lists\---

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Copper (7440-50-8)	No	No	None

---

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Not regulated.

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Copper (7440-50-8)	Yes	Yes	No	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.

Copper (7440-50-8)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Copper (7440-50-8)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Copper (7440-50-8)	5000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE LIVER AND KIDNEYS. CHRONIC EXPOSURE MAY CAUSE TISSUE DAMAGE.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Avoid breathing dust or vapors.
Keep container closed.
Use only with adequate ventilation.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

APPENDIX I

MEC Hazard Assessment Worksheets

MEC HA Workbook v1.02

December-07

Overview

This workbook is a tool for project teams to assess explosive hazards to human receptors at munitions response sites (MRSs) following the Munitions and Explosives of Concern Hazard Assessment (MEC HA) methodology. The MEC HA allows a project team to evaluate potential explosive hazard associated with a site, given current site conditions, under various cleanup, land use activities, and land use control alternatives. A complete description of the methodology can be found in the MEC HA Guidance (Public Review Draft, November 2006). Please reference this guidance when completing the worksheets.

Instructions

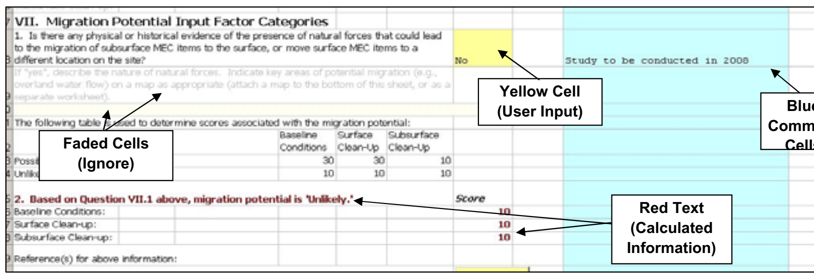
1. Open this file. Enable macros if prompted to do so. This spreadsheet will not work if your security setting is set to 'high' or 'very high'. To change your security level, go to the menu bar and select Tools/Macro/Security. Then close and reopen this spreadsheet.
2. This MS Excel workbook contains 9 worksheets, designed to be used in order. After the '***Instructions***' sheet, the first 5 sheets ask for information about the following topics:

Summary Info - General information regarding the site.
Munitions/Explosive Info - MECs and bulk explosives present at the site.
Current and Future Activities - Current land use activites as well as planned future activities, if any.
Remedial-Removal Action - General information regarding remediation/removal alternatives being considered for the site.
Post-Response Land Use - Land use activities associated with the alternatives listed in the 'Remedial-Removal Action' sheet.

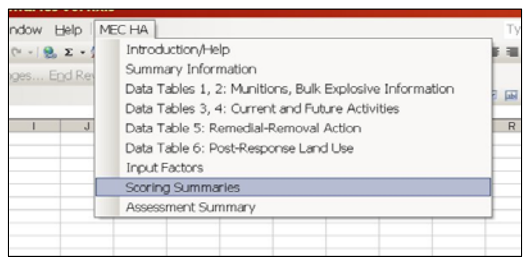
The remaining 3 sheets calculate and summarize the scores. The ***Input Factors*** sheet performs the Input Factor Score calculations, which are summarized in the ***Scoring Summaries*** sheet. The ***Hazard Level*** sheet presents the Hazard Level Category for current use activities, future use activities, and each response alternative based on the respective scores.

3. Starting with the ***Summary Info*** sheet, fill in any yellow cells. Some cells have drop-down lists from which you can select an answer. Select the cell. A down arrow to the right indicates that a drop-down list is available. Yellow buttons can be used to enter reference information. Blue cells can be used for any general comments you wish to make. Any faded cells can be ignored--these are questions that the spreadsheet has determined are not relevant for your situation.

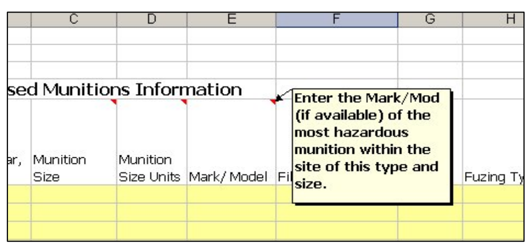
The computer will calculate information based on your inputs. Calculated information will appear as red text



4. The MEC HA menu bar can be used to navigate to different worksheets.



5. Small red triangles in the upper-right corners indicate that help text is available by putting the mouse cursor on that cell.



MEC HA Summary Information

Comments

Site ID: UXO 0022 Waikane Valley Impact Area - Non-target Areas
Date: 7/19/2010

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

UXO 00221 Impact Area

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	Draft Environmental Assessment, September 2004
2	Draft EE/CA, 2006
3	Draft Final SI Report, September 2009
4	RI Daily Operations Summaries, 3/15 to 5/13 2010
5	
6	
7	
8	
9	
10	
11	
12	

B. Briefly describe the site:

1. Area (include units): 35 acres
2. Past munitions-related use: Jungle training and field manevers

Safety Buffer Areas

3. Current land-use activities (list all that occur):

Nature Preserve

4. Are changes to the future land-use planned? Yes
5. What is the basis for the site boundaries?

Determined by MEC removal and reconnaissance observations

6. How certain are the site boundaries?

High confidence that boundaries define the intended target areas

Reference(s) for Part B:

Draft Environmental Assessment, September 2004
Draft EE/CA, 2006

Select Ref(s)

C. Historical Clearances

1. Have there been any historical clearances at the site? Yes, surface clearance
2. If a clearance occurred:

a. What year was the clearance performed? 1976, 1984, and 2010

b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

1976 surface clearance removed 24,000 lbs of practice ordnance including 42 UXOs. 1984 surface clearance removed 16,000 lbs practice ordnance including 190 UXOs. 2010 surface clearance removed approximately 8080 lbs of practice ordnance including 115 UXOs.

Reference(s) for Part C:

Draft Final SI Report, September 2009

Select Ref(s)

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

See Figure 6-1 for site map

Site ID: **UXO 0022 Waikane Valley Impact Area - Non-target Areas**
Date: **7/19/2010**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Rockets	3.5	inches	M28 HEAT	High Explosive	Yes	Impact	UNK	0	Surface and Subsurface	
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:

RI Daily Operations Summaries, 3/15 to 5/13 2010

Select Ref(s)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

Site ID: **UXO 0022 Waikane Valley Impact Area - Non-target Areas**
Date: **7/19/2010**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Boar hunting (trespassing)	10	8	80	0	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **80**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Select Ref(s)

Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Nature Preserve	10	8	80	0	boar hunting, hiking
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **80**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Select Ref(s)

Site ID: **UXO 0022 Waikane Valley Impact Area - Non-target Areas**
Date: **7/19/2010**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1	No Action	0	Very Limited Accessibility	No	No MEC cleanup	
2	Land Use Controls	0	Very Limited Accessibility	No	No MEC cleanup	
3	Surface Clearance	1	Very Limited Accessibility	No	cleanup of MECs located on the surface only	
4	Surface and Subsurface Clearance	2	Very Limited Accessibility	No	cleanup of MECs located both on the surface and subsurface	
5						
6						

For those alternatives where you answered 'No' in Column E, are land-use activities to be assessed against current or future land uses?	Current	

Reference(s) for table above:

Site ID: **UXO 0022 Waikane Valley Impact Area - Non-target Areas**
Date: **7/19/2010**

This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.

Land Use Activities Planned After Response Alternative #1: No Action

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Nature Preserve	50	8	400	0	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **400**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #2: Land Use Controls

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Nature preserve	50	8	400	0	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **400**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Site ID: **UXO 0022 Waikane Valley**
Date: **7/19/2010**

Energetic Material Type Input Factor Categories

Comments

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 1420 feet
2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? No
3. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for current use activities

Select MEC(s)

Item #1. Rockets (3.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc? No
6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

Select MEC(s)

Item #1. Rockets (3.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

7. Future use activities are 'Outside of the ESQD arc', based on Question 5.'

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities — *Score*

Select the category that best describes the site accessibility under the current use scenario

Very Limited Accessibility

Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario

Very Limited Accessibility

Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Reference(s) for above information:

Select Ref(s)

Response Alternative No. 1: No Action

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Very Limited Accessibility'.

Baseline Conditions:	**5**
Surface Cleanup:	**5**
Subsurface Cleanup:	**5**

Response Alternative No. 2: Land Use Controls

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Very Limited Accessibility'.

Baseline Conditions:	**5**
Surface Cleanup:	**5**
Subsurface Cleanup:	**5**

Response Alternative No. 3: Surface Clearance

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Very Limited Accessibility'.

Baseline Conditions:	**5**
Surface Cleanup:	**5**
Subsurface Cleanup:	**5**

Response Alternative No. 4: Surface and Subsurface Clearance

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Very Limited Accessibility'.

Baseline Conditions:	**5**
Surface Cleanup:	**5**
Subsurface Cleanup:	**5**

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

Current Use Activities:

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **80** receptor hrs/yr

Based on the table above, this corresponds to a input factor score for baseline conditions of **15** Score

Future Use Activities:

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **80** receptor hrs/yr

Based on the table above, this corresponds to a input factor score of: **15** Score

Response Alternative No. 1: No Action

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet) **80**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

Response Alternative No. 2: Land Use Controls

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet) **80**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

Response Alternative No. 3: Surface Clearance

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet) **80**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

Response Alternative No. 4: Surface and Subsurface Clearance

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet) **80**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Maneuver Areas

	Score
Baseline Conditions:	**115**
Surface Cleanup:	**15**
Subsurface Cleanup:	**5**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft

The deepest intrusive depth: **0** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered.

240 ***Score***

Future Use Activities

Deepest intrusive depth: **0** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'. For 'Future Use Activities', only Baseline Conditions are considered. **240** ***Score***

Response Alternative No. 1: No Action

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **0** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet) **0** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

	Score
Baseline Conditions:	**240**
Surface Cleanup:	
Subsurface Cleanup:	

Response Alternative No. 2: Land Use Controls

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **0** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet) **0** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

	Score
Baseline Conditions:	**240**
Surface Cleanup:	
Subsurface Cleanup:	

Response Alternative No. 3: Surface Clearance

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet) **0** ft

Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'

	Score
Baseline Conditions:	
Surface Cleanup:	**50**
Subsurface Cleanup:	

Response Alternative No. 4: Surface and Subsurface Clearance

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **2** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet) **0** ft

Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	**25**

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items? Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Overland water flow

The following table is used to determine scores associated with the migration potential

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.'

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:

Select Ref(s)

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'Maneuver Areas'. It is assumed that the MEC items in this MRS are DMM.

Has a technical assessment shown that MEC in the OB/OD Area is DMM?

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: Yes

· Submunitions
· Rifle-propelled 40mm projectiles (often called 40mm grenades)
· Munitions with white phosphorus filler
· High explosive anti-tank (HEAT) rounds
· Hand grenades
· Fuzes
· Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories

Fuzed DMM Special Case	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case	180	180	180
UXO	110	110	110
Fuzed DMM Special Case	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'Fuzed DMM Special Case'.

	Score
Baseline Conditions:	**105**
Surface Cleanup:	**105**
Subsurface Cleanup:	**105**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	UXO 0022 Waikane Valley Impact Area - Non-target Areas	a. Scoring Summary for Current Use Activities	
Date:	7/19/2010	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Very Limited Accessibility	15
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Maneuver Areas	115
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	660
		Hazard Level Category	3

Site ID:	UXO 0022 Waikane Valley Impact Area - Non-target Areas	b. Scoring Summary for Future Use Activities	
Date:	7/19/2010	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Very Limited Accessibility	15
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Maneuver Areas	115
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	660
		Hazard Level Category	3

Site ID:	UXO 0022 Waikane Valley Impact Area - Non-target Areas	c. Scoring Summary for Response Alternative 1: No Action	
Date:	7/19/2010	Response Action Cleanup:	No MEC cleanup
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Very Limited Accessibility	5
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Maneuver Areas	115
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	650
		Hazard Level Category	3

Site ID: UXO 0022 Waikane Valley Impact Area - Non-target Areas	**d. Scoring Summary for Response Alternative 2: Land Use Controls**	
Date: 7/19/2010	**Response Action Cleanup:**	**No MEC cleanup**
Input Factor	**Input Factor Category**	**Score**
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors	Outside of the ESQD arc	0
III. Site Accessibility	Very Limited Accessibility	5
IV. Potential Contact Hours	<10,000 receptor-hrs/yr	15
V. Amount of MEC	Maneuver Areas	115
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth	Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential	Possible	30
VIII. MEC Classification	Fuzed DMM Special Case	105
IX. MEC Size	Small	40
	Total Score	**650**
	Hazard Level Category	**3**

Site ID: UXO 0022 Waikane Valley Impact Area - Non-target Areas	**e. Scoring Summary for Response Alternative 3: Surface Clearance**	
Date: 7/19/2010	**Response Action Cleanup:**	**cleanup of MECs located on the surface only**
Input Factor	**Input Factor Category**	**Score**
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors	Outside of the ESQD arc	0
III. Site Accessibility	Very Limited Accessibility	5
IV. Potential Contact Hours	<10,000 receptor-hrs/yr	10
V. Amount of MEC	Maneuver Areas	15
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth	Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	50
VII. Migration Potential	Possible	30
VIII. MEC Classification	Fuzed DMM Special Case	105
IX. MEC Size	Small	40
	Total Score	**355**
	Hazard Level Category	**4**

Site ID: UXO 0022 Waikane Valley Impact Area - Non-target Areas	**f. Scoring Summary for Response Alternative 4: Surface and Subsurface Clearance**	
Date: 7/19/2010	**Response Action Cleanup:**	**cleanup of MECs located both on the surface and subsurface**
Input Factor	**Input Factor Category**	**Score**
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors	Outside of the ESQD arc	0
III. Site Accessibility	Very Limited Accessibility	5
IV. Potential Contact Hours	<10,000 receptor-hrs/yr	5
V. Amount of MEC	Maneuver Areas	5
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth	Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	25
VII. Migration Potential	Possible	10
VIII. MEC Classification	Fuzed DMM Special Case	105
IX. MEC Size	Small	40
	Total Score	**295**
	Hazard Level Category	**4**

MEC HA Hazard Level Determination		
Site ID: Impact Area - Non-target		
Date: 7/19/2010		
	Hazard Level Category	Score
a. Current Use Activities	3	660
b. Future Use Activities	3	660
c. Response Alternative 1: No Action	3	650
d. Response Alternative 2: Land Use Controls	3	650
e. Response Alternative 3: Surface Clearance	4	355
f. Response Alternative 4: Surface and Subsurface Clearance	4	295
g. Response Alternative 5:		
h. Response Alternative 6:		

Characteristics of the MRS	
Is critical infrastructure located within the MRS or within the ESQD arc?	No
Are cultural resources located within the MRS or within the ESQD arc?	No
Are significant ecological resources located within the MRS or within the ESQD arc?	No

MEC HA Workbook v1.02

December-07

Overview

This workbook is a tool for project teams to assess explosive hazards to human receptors at munitions response sites (MRSs) following the Munitions and Explosives of Concern Hazard Assessment (MEC HA) methodology. The MEC HA allows a project team to evaluate potential explosive hazard associated with a site, given current site conditions, under various cleanup, land use activities, and land use control alternatives. A complete description of the methodology can be found in the MEC HA Guidance (Public Review Draft, November 2006). Please reference this guidance when completing the worksheets.

Instructions

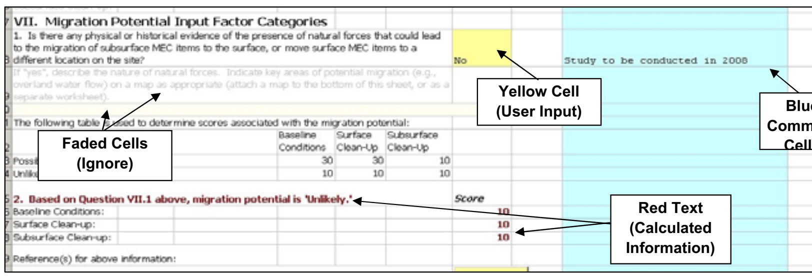
1. Open this file. Enable macros if prompted to do so. This spreadsheet will not work if your security setting is set to 'high' or 'very high'. To change your security level, go to the menu bar and select Tools/Macro/Security. Then close and reopen this spreadsheet.
2. This MS Excel workbook contains 9 worksheets, designed to be used in order. After the '***Instructions***' sheet, the first 5 sheets ask for information about the following topics:

Summary Info - General information regarding the site.
Munitions/Explosive Info - MECs and bulk explosives present at the site.
Current and Future Activities - Current land use activites as well as planned future activities, if any.
Remedial-Removal Action - General information regarding remediation/removal alternatives being considered for the site.
Post-Response Land Use - Land use activities associated with the alternatives listed in the 'Remedial-Removal Action' sheet.

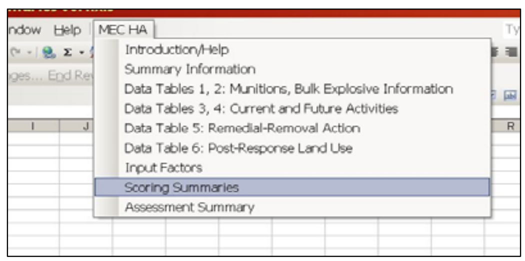
The remaining 3 sheets calculate and summarize the scores. The ***Input Factors*** sheet performs the Input Factor Score calculations, which are summarized in the ***Scoring Summaries*** sheet. The ***Hazard Level*** sheet presents the Hazard Level Category for current use activities, future use activities, and each response alternative based on the respective scores.

3. Starting with the ***Summary Info*** sheet, fill in any yellow cells. Some cells have drop-down lists from which you can select an answer. Select the cell. A down arrow to the right indicates that a drop-down list is available. Yellow buttons can be used to enter reference information. Blue cells can be used for any general comments you wish to make. Any faded cells can be ignored--these are questions that the spreadsheet has determined are not relevant for your situation.

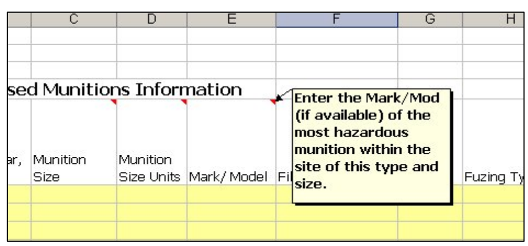
The computer will calculate information based on your inputs. Calculated information will appear as red text



4. The MEC HA menu bar can be used to navigate to different worksheets.



5. Small red triangles in the upper-right corners indicate that help text is available by putting the mouse cursor on that cell.



MEC HA Summary Information

Comments

Site ID: UXO 0022 Waikane Valley Impact Area - Target Areas
Date: 7/19/2010

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

UXO 00221 Impact Area

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	Draft Environmental Assessment, September 2004
2	Draft EE/CA, 2006
3	Draft Final SI Report, September 2009
4	RI Daily Operations Summaries, 3/15 to 5/13 2010
5	
6	
7	
8	
9	
10	
11	
12	

B. Briefly describe the site:

1. Area (include units): 35 acres
2. Past munitions-related use: Jungle training and field manevers

Target Area

3. Current land-use activities (list all that occur):

Nature Preserve

4. Are changes to the future land-use planned? Yes
5. What is the basis for the site boundaries?

Determined by MEC removal and reconnaissance observations

6. How certain are the site boundaries?

High confidence that boundaries define the intended target areas

Reference(s) for Part B:

Draft Environmental Assessment, September 2004
Draft EE/CA, 2006

Select Ref(s)

C. Historical Clearances

1. Have there been any historical clearances at the site? Yes, surface clearance
2. If a clearance occurred:

a. What year was the clearance performed? 1976, 1984, and 2010

b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

1976 clearance removed 24,000 lbs of practice ordnance including 42 UXOs. 1984 clearance removed 16,000 lbs practice ordnance including 190 UXOs. 2010 clearance removed approximately 8080 lbs of practice ordnance including 115 UXOs.

Reference(s) for Part C:

Draft Final SI Report, September 2009

Select Ref(s)

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

See Figure 6-1 for site map

Site ID: **UXO 0022 Waikane Valley Impact Area - Target Areas**
Date: **7/19/2010**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Rockets	3.5	inches	M28 HEAT	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	
2	Rockets	2.36	inches	M6 HEAT	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	
3	Grenades			M28 HEAT	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	
4	Grenades			M30	Low Explosive Filler in a fragmenting round	Yes	Time	Unarmed	0	Surface and Subsurface	
5	Demolition Charges	0.25	lb	M030	High Explosive	No			0	Surface and Subsurface	
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:

Select Ref(s)

RI Daily Operations Summaries, 3/15 to 5/13 2010

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

Site ID: **UXO 0022 Waikane Valley Impact Area - Target Areas**
Date: **7/19/2010**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Boar hunting (trespassing)	50	8	**400**	0	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **400**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Select Ref(s)

Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Nature Preserve	50	8	**400**	0	boar hunting, hiking
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **400**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Select Ref(s)

Site ID: **UXO 0022 Waikane Valley Impact Area - Target Areas**
Date: **7/19/2010**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1	No Action	0	Moderate Accessibility	No	No MEC cleanup	
2	Land Use Controls	0	Limited Accessibility	No	No MEC cleanup	
3	Surface Clearance	1	Moderate Accessibility	No	cleanup of MECs located on the surface only	
4	Surface and Subsurface Clearance	2	Full Accessibility	Yes	cleanup of MECs located both on the surface and subsurface	
5						
6						

For those alternatives where you answered 'No' in Column E, are land-use activities to be assessed against current or future land uses?	Current	

Reference(s) for table above:

Site ID: **UXO 0022 Waikane Valley Impact Area - Target Areas**
Date: **7/19/2010**

This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.

Land Use Activities Planned After Response Alternative #1: No Action

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Nature Preserve	50	8	**400**	0	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **400**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #2: Land Use Controls

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Nature preserve	50	8	**400**	0	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **400**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Site ID: **UXO 0022 Waikane Valley**

Date: **7/19/2010**

Energetic Material Type Input Factor Categories

Comments

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 1420 feet

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? No

3. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for current use activities

Select MEC(s)

Item #1. Rockets (3.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc? No

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

Select MEC(s)

Item #1. Rockets (3.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

7. Future use activities are 'Outside of the ESQD arc', based on Question 5.'

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities	***Score***
Select the category that best describes the site accessibility under the current use scenario	
Limited Accessibility	
Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Future Use Activities	
Select the category that best describes the site accessibility under the future use scenario	
Limited Accessibility	
Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Reference(s) for above information:

Select Ref(s)

Response Alternative No. 1: No Action

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.

Baseline Conditions:	**55**
Surface Cleanup:	**55**
Subsurface Cleanup:	**55**

Response Alternative No. 2: Land Use Controls

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Limited Accessibility'.

Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Response Alternative No. 3: Surface Clearance

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.

Baseline Conditions:	**55**
Surface Cleanup:	**55**
Subsurface Cleanup:	**55**

Response Alternative No. 4: Surface and Subsurface Clearance

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.

Baseline Conditions:	**80**
Surface Cleanup:	**80**
Subsurface Cleanup:	**80**

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

Current Use Activities:

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **400** receptor hrs/yr
Based on the table above, this corresponds to a input factor score for baseline conditions of **15** Score

Future Use Activities:

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **400** receptor hrs/yr
Based on the table above, this corresponds to a input factor score of: **15** Score

Response Alternative No. 1: No Action

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet) **400**

Based on the table above, this corresponds to input factor scores of:	***Score***
Baseline Conditions:	**15**
Surface Cleanup:	**10**
Subsurface Cleanup:	**5**

Response Alternative No. 2: Land Use Controls

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet) **400**

Based on the table above, this corresponds to input factor scores of:	***Score***
Baseline Conditions:	**15**
Surface Cleanup:	**10**
Subsurface Cleanup:	**5**

Response Alternative No. 3: Surface Clearance

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet) **400**

Based on the table above, this corresponds to input factor scores of:	***Score***
Baseline Conditions:	**15**
Surface Cleanup:	**10**
Subsurface Cleanup:	**5**

Response Alternative No. 4: Surface and Subsurface Clearance

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.
Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **24,000**

Based on the table above, this corresponds to input factor scores of:	***Score***
Baseline Conditions:	**40**
Surface Cleanup:	**20**
Subsurface Cleanup:	**10**

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Target Area

	Score
Baseline Conditions:	**180**
Surface Cleanup:	**120**
Subsurface Cleanup:	**30**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft

The deepest intrusive depth: **0** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered.

240 ***Score***

Future Use Activities

Deepest intrusive depth: **0** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'. For 'Future Use Activities', only Baseline Conditions are considered. **240** ***Score***

Response Alternative No. 1: No Action

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **0** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet) **0** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

	Score
Baseline Conditions:	**240**
Surface Cleanup:	
Subsurface Cleanup:	

Response Alternative No. 2: Land Use Controls

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **0** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet) **0** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

	Score
Baseline Conditions:	**240**
Surface Cleanup:	
Subsurface Cleanup:	

Response Alternative No. 3: Surface Clearance

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet) **0** ft

Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'

	Score
Baseline Conditions:	
Surface Cleanup:	**50**
Subsurface Cleanup:	

Response Alternative No. 4: Surface and Subsurface Clearance

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **2** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **2** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	**95**

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items? Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Overland water flow

The following table is used to determine scores associated with the migration potential

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.'

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:

Select Ref(s)

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'Target Area'. It cannot be automatically assumed that the MEC items from this category are DMM. Therefore, the conservative assumption is that the MEC items in this MRS are UXO.

Has a technical assessment shown that MEC in the OB/OD Area is DMM?

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: Yes

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories

UXO Special Case	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case	180	180	180
UXO	110	110	110
Fuzed DMM Special Case	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'UXO Special Case'.

	Score
Baseline Conditions:	**180**
Surface Cleanup:	**180**
Subsurface Cleanup:	**180**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	UXO 0022 Waikane Valley Impact Area - Target Areas	a. Scoring Summary for Current Use Activities	
Date:	7/19/2010	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Limited Accessibility	15
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	800
		Hazard Level Category	2

Site ID:	UXO 0022 Waikane Valley Impact Area - Target Areas	b. Scoring Summary for Future Use Activities	
Date:	7/19/2010	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Limited Accessibility	15
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	800
		Hazard Level Category	2

Site ID:	UXO 0022 Waikane Valley Impact Area - Target Areas	c. Scoring Summary for Response Alternative 1: No Action	
Date:	7/19/2010	Response Action Cleanup:	No MEC cleanup
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	840
		Hazard Level Category	1

Site ID:	UXO 0022 Waikane Valley Impact Area - Target Areas	d. Scoring Summary for Response Alternative 2: Land Use Controls	
Date:	7/19/2010	Response Action Cleanup:	No MEC cleanup
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Limited Accessibility	15
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	800
		Hazard Level Category	2

Site ID:	UXO 0022 Waikane Valley Impact Area - Target Areas	e. Scoring Summary for Response Alternative 3: Surface Clearance	
Date:	7/19/2010	Response Action Cleanup:	cleanup of MECs located on the surface only
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	10
V. Amount of MEC		Target Area	120
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	50
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	585
		Hazard Level Category	3

Site ID:	UXO 0022 Waikane Valley Impact Area - Target Areas	f. Scoring Summary for Response Alternative 4: Surface and Subsurface Clearance	
Date:	7/19/2010	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Full Accessibility	80
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	10
V. Amount of MEC		Target Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	545
		Hazard Level Category	3

MEC HA Hazard Level Determination		
Site ID: Impact Area - Target Areas		
Date: 7/19/2010		
	Hazard Level Category	**Score**
a. Current Use Activities	2	800
b. Future Use Activities	2	800
c. Response Alternative 1: No Action	1	840
d. Response Alternative 2: Land Use Controls	2	800
e. Response Alternative 3: Surface Clearance	3	585
f. Response Alternative 4: Surface and Subsurface Clearance	3	545
g. Response Alternative 5:		
h. Response Alternative 6:		

Characteristics of the MRS	
Is critical infrastructure located within the MRS or within the ESQD arc?	No
Are cultural resources located within the MRS or within the ESQD arc?	No
Are significant ecological resources located within the MRS or within the ESQD arc?	No

APPENDIX J

Munitions Response Site Prioritization Protocol

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered most likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	**30**
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	**25**
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high-explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	**15**
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrotechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic filler (i.e., red phosphorus), other than white phosphorus filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition. (Physical evidence or historical evidence that no other types of munitions [e.g., grenades, subcaliber training rockets, demolition charges] were used or are present on the MRS is required for selection of this category.)	**2**
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**30**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

Past and recent investigations have confirmed the site as having the following munitions: 2.36-inch HEAT Rockets, 3.5-inch HEAT Rockets, M28 HEAT Rifle Grenades, M29 Practice Rifle Grenades, 60 mm HE Mortars, 75 mm HE Projectile, military TNT explosive charges, and small arms. This table has been updated based on the findings during the Remedial Investigation completed May 2010.

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms range, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	10
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**10**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

Between 1943 and 1953, the Army leased over 2000 acres for maneuvers, jungle training, and small arms, artillery, and mortar firing. The U.S. Marines leased 1061 acres of the training area in 1953 and continued the leases until 1976. Marine Corps training consisted of small arms fire, shoulder fired rockets, rifle grenades and possibly medium artillery fire. After the Marines investigated and conducted an ordnance clearance in 1976, they reported 187 acres of the WVTA would never be free of duds, practice ordnance, etc. (From Section 3.1.2 of the Archive Search Reports, Marine Corps Base Hawaii and Associated Sites, Oahu, Hawaii of Dec 2001, and Section 2.34.2 of the Range Identification and Preliminary Range Assessment, Marine Corps Base Hawaii and Associated Sites, Oahu, Hawaii of Dec 2001).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms *confirmed, surface, subsurface, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO or DMM occurred) indicates there are UXO or DMM on the surface of the MRS.	**25**
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	**20**
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris such as fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	10
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	5
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	**1**
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	**25**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

An Army sweep in 1945 confirmed that surface munitions existed in the area. In August 1976, Marine EOD conducted a clearance operation in the main impact areas confirming UXO and DMM existed on the surface of the MRS. In April 1984, Marine EOD conducted a range clearance confirming the existence of surface UXO and DMM. In May 1984, Marine EOD responded to the same area after heavy rains uncovered additional munitions. In October 2008 a Site Investigation was conducted confirming the existence of surface UXO and small arms ammunitions. In May 2010 a Remedial Investigation was conducted confirming the existence of surface UXO and DMM along with small arms ammunitions. During the same Remedial Investigation, it was also confirmed that UXO and small arms existed in the sub-surface within the MRS.

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

During the Site Inspection conducted during October 2008 it was confirmed and verified most of the area is fenced off with warning signs and the area is restricted to authorized personnel only. Gaps in the fence line are at stream crossings and at the steepest portions of the site 600 foot elevation and above. The area is currently controlled and maintained by MCBH Kaneohe. Authorized entry into this area requires escort by Military Police and EOD personnel.

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies. ◆ The MRS is at a location that is owned by DoD, but that DoD has leased to another entity and for which DoD does not control access 24 hours per day.	5
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

From Section 4.1.21 of the Archives Search Report, Marine Corps Base Hawaii and Associated Sites, Oahu, Hawaii of Dec 2001 and Section 1.2 of the Site Inspection Work Plan, Munitions Response Sites, Waikane Valley Training Area, Kaneohe, Hawaii of 28 Nov 2006, the property is currently controlled and maintained by the Marine Corps.

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Use the U.S. Census Bureau tract data available to capture the **highest** population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

The 2000 U.S. Census Bureau, Hawaii Profile map of Hawaii indicates that the Waikane Valley area population is less than 15.0 persons per square mile. However, the Waikane and Waihole areas are within two miles of the WVTA. The Census map indicates that the population is between 200.0 to 999.9 persons per square mile.

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the number of inhabited structures.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

The Site Inspection Work Plan, Munitions Response Sites, Waikane Valley Training Area, Kaneohe, HI of 28 Nov 2006 identifies single family homes, industrial or warehouse areas, and a park within two miles of the site.

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the scores that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

The Site Inspection Work Plan, Munitions Response Sites, Waikane Valley Training Area, Kaneohe, HI of 28 Nov 2006, identifies single family homes, industrial or warehouse areas, State Forest Reserve, and a park within two miles of the site.

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	5
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**3**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

The Site Inspection Work Plan, Munitions Response Sites, Waikane Valley Training Area, Kaneohe, HI of 28 Nov 2006, states no ecological resources are present within the MRS. The Environmental Assessment notes that a heiau or shrine within the National Register of Historic Places was identified and recorded in Feb 2004. The property was divided into three zones; A, B and C. Zone A, along Waikane Stream; Zone b, a transition area between the flatter areas near Waikane Stream and the extremely steep slopes along the valley walls; and Zone C, the extremely steep slopes along the valley walls. Seven sites were evaluated, several of them within a National Historic Register site. Four were confirmed as significant, two were recommended for deletion from state inventory and one was newly identified as historic. All culturally significant sites appear to be located in Zone A, less than 0.2 kilometers from Waikane Stream.

Table 10
Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	**30**	**40**
Source of Hazard	Table 2	**10**	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	**25**	**33**
Ease of Access	Table 4	**8**	
Status of Property	Table 5	**0**	
Receptor Factor Data Elements			
Population Density	Table 6	**5**	**18**
Population Near Hazard	Table 7	**5**	
Types of Activities/Structures	Table 8	**5**	
Ecological and/or Cultural Resources	Table 9	**3**	
EHE MODULE TOTAL			**91**

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**B**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond with **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS are: ◆ CWM that are UXO (i.e., CWM/UXO) ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS are: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS are CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	0
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

The Site Investigation and Remedial Investigation conducted at the MRS confirmed that both historical and physical evidence indicates that CWM were not used or present at the MRS.

Table 12

CHE Module: Sources of CWM Data Element Table

DIRECTIONS: Below are 11 sources of CWM hazards and their descriptions. Review these classifications and circle the scores that correspond with **all** the sources of CWM hazards known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, CAIS/DMM, surface, subsurface, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Live-fire involving CWM	◆ The MRS is a former military range that supported live-fire of explosively configured CWM and the CWM/UXO are known or suspected of being present on the surface or in the subsurface. ◆ The MRS is a former military range that supported live-fire with conventional munitions, and CWM/DMM are on the surface or in the subsurface commingled with conventional munitions that are UXO.	10
Damaged CWM/DMM surface or subsurface	◆ There are damaged CWM/DMM on the surface or in the subsurface at the MRS.	10
Undamaged CWM/DMM surface	◆ There are undamaged CWM/DMM on the surface at the MRS.	10
CAIS/DMM surface	◆ There are CAIS/DMM on the surface.	10
Undamaged CWM/DMM, subsurface	◆ There are undamaged CWM/DMM in the subsurface at the MRS.	5
CAIS/DMM subsurface	◆ There are CAIS/DMM in the subsurface at the MRS.	5
Former CA or CWM Production Facilities	◆ The MRS is a facility that formerly engaged in production of CA or CWM, and CWM/DMM is suspected of being present on the surface or in the subsurface.	3
Former Research, Development, Testing, and Evaluation (RDT&E) facility using CWM	◆ The MRS is at a facility that formerly was involved in non-live-fire RDT&E activities (including static testing) involving CWM, and there are CWM/DMM suspected of being present on the surface or in the subsurface.	3
Former Training Facility using CWM or CAIS	◆ The MRS is a location that formerly was involved in training activities involving CWM and/or CAIS (e.g., training in recognition of CWM, decontamination training) and CWM/DMM or CAIS/DMM are suspected of being present on the surface or in the subsurface.	2
Former Storage or Transfer points of CWM	◆ The MRS is a former storage facility or transfer point (e.g., intermodal transfer) for CWM.	1
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	0
SOURCES OF CWM	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Sources of CWM*** classifications in the space provided.

The Site Investigation and Remedial Investigation conducted at the MRS confirmed that both historical and physical evidence indicates that CWM were not used or present at the MRS.

Table 13

CHE Module: Location of CWM Data Element Table

DIRECTIONS: Below are seven classifications of CWM locations and their descriptions. Review these locations and circle the scores that correspond with **all** the locations where CWM are known or suspected of being found at the MRS.

Note: The terms *confirmed, surface, subsurface, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are CWM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report, that an incident or accident that involved CWM, regardless of configuration, occurred) indicates there are CWM on the surface of the MRS.	25
Confirmed subsurface, active	◆ Physical evidence indicates the presence of CWM in the subsurface of the MRS and the geological conditions at the MRS are likely to cause CWM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose CWM. ◆ Historical evidence indicates that CWM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause CWM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose CWM.	20
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of CWM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause CWM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause CWM to be exposed. ◆ Historical evidence indicates that CWM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause CWM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause CWM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence, other than the documented presence of CWM, indicating that CWM may be present at the MRS.	10
Suspected (historical evidence)	◆ There is historical evidence indicating that CWM may be present at the MRS.	5
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that CWM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the CWM.	2
Evidence of no CWM	◆ Following investigation of the MRS, there is physical evidence that there is no CWM present or there is historical evidence indicating that no CWM are present.	0
LOCATION OF CWM	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of CWM*** classifications in the space provided.

The Site Investigation and Remedial Investigation conducted at the MRS confirmed that both historical and physical evidence indicates that CWM were not used or present at the MRS.

Table 14

CHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

During the Site Inspection conducted during October 2008 it was confirmed and verified most of the area is fenced off with warning signs and the area is restricted to authorized personnel only. Gaps in the fence line are at stream crossings and at the steepest portions of the site 600 foot elevation and above. The area is currently controlled and maintained by MCBH Kaneohe. Authorized entry into this area requires escort by Military Police and EOD personnel.

Table 15

CHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	• The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal or local governments; and land or water bodies managed by other federal agencies. • The MRS is at a location that is owned by DoD, but that DoD has leased to another entity and for which DoD does not control access 24 hours per day.	5
Scheduled for transfer from DoD control	• The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	• The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD controls access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

From Section 4.1.21 of the Archives Search Report, Marine Corps Base Hawaii and Associated Sites, Oahu, Hawaii of Dec 2001 and Section 1.2 of the Site Inspection Work Plan, Munitions Response Sites, Waikane Valley Training Area, Kaneohe, Hawaii of 28 Nov 2006, the property is currently controlled and maintained by the Marine Corps.

Table 16

CHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Use the U.S. Census Bureau tract data available to capture the **highest** population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

The 2000 U.S. Census Bureau, Hawaii Profile map of Hawaii indicates that the Waikane Valley area population is less than 15.0 persons per square mile. However, the Waikane and Waihole areas are within two miles of the WVTA. The Census map indicates that the population is between 200.0 to 999.9 persons per square mile.

Table 17

CHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the number of inhabited structures.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

The Site Inspection Work Plan, Munitions Response Sites, Waikane Valley Training Area, Kaneohe, HI of 28 Nov 2006 identifies single family homes, industrial or warehouse areas, and a park within two miles of the site.

Table 18

CHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the scores that correspond with **all** the activities/structures classifications at the MRS.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known of recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

The Site Inspection Work Plan, Munitions Response Sites, Waikane Valley Training Area, Kaneohe, HI of 28 Nov 2006, identifies single family homes, industrial or warehouse areas, State Forest Reserve, and a park within two miles of the site.

Table 19

CHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	5
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**3**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

The Site Inspection Work Plan, Munitions Response Sites, Waikane Valley Training Area, Kaneohe, HI of 28 Nov 2006, states no ecological resources are present within the MRS. The Environmental Assessment notes that a heiau or shrine within the National Register of Historic Places was identified and recorded in Feb 2004. The property was divided into three zones; A, B and C. Zone A, along Waikane Stream; Zone b, a transition area between the flatter areas near Waikane Stream and the extremely steep slopes along the valley walls; and Zone C, the extremely steep slopes along the valley walls. Seven sites were evaluated, several of them within a National Historic Register site. Four were confirmed as significant, two were recommended for deletion from state inventory and one was newly identified as historic. All culturally significant sites appear to be located in Zone A, less than 0.2 kilometers from Waikane Stream.

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	**0**	**0**
Sources of CWM	Table 12	**0**	
Accessibility Factor Data Elements			
Location of CWM	Table 13	**0**	**8**
Ease of Access	Table 14	**8**	
Status of Property	Table 15	**0**	
Receptor Factor Data Elements			
Population Density	Table 16	**5**	**18**
Population Near Hazard	Table 17	**5**	
Types of Activities/Structures	Table 18	**5**	
Ecological and/or Cultural Resources	Table 19	**3**	
CHE MODULE TOTAL			**26**

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional groundwater contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Groundwater MC Hazard ❑

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional surface water contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard with human endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ❑

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional sediment contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
Copper	110	3,100	0.035
CHF Scale	**CHF Value**	**Sum The Ratios**	**0.035**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	**L (Low)**		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).	**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Sediment (Human Endpoint) MC Hazard ❑

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional surface water contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum the Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ❑

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional sediment contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
Copper	110	31.6	3.481
CHF Scale	**CHF Value**	**Sum the Ratios**	**3.481**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ❑

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional surface soil contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
Antimony	56	31.0	1.806
Copper	5,000	3,100	1.612
CHF Scale	**CHF Value**	**Sum the Ratios**	**3.418**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Surface Soil MC Hazard ❑

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants in any given medium present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B of the Primer) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Do not add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard**, **Migration Pathway**, and **Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the **HHE Ratings** provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)					
Surface Water/Human Endpoint (Table 22)					
Sediment/Human Endpoint (Table 23)	L	M	M	MML	E
Surface Water/Ecological Endpoint (Table 24)					
Sediment/Ecological Endpoint (Table 25)	M	M	M	MMM	D
Surface Soil (Table 26)	M	M	M	MMM	D

HHE MODULE RATING: D

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box.

Note:

An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the **MRS Priority or Alternative MRS Rating** at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		No Known or Suspected CWM Hazard		No Known or Suspected MC Hazard	
MRS PRIORITY or ALTERNATIVE MRS RATING				**3**	

Table A
MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Waikane Valley Training Area

Component: Marine Corps

Installation/Property Name: Marine Corps Base Hawaii (MCBH) Kaneohe

Location (City, County, State): Kaneohe, Honolulu County, Hawaii

Site Name/Project Name (Project No.): MCBH Waikane Valley Training Area MRS / UXO 22

Date Information Entered/Updated: 01 October 2010

Point of Contact (Name/Phone): Lance Higa / (808) 472-1421

Project Phase (check only one):

❑ PA	☐ SI	☒ RI	❑ FS	❑ RD
❑ RA-C	❑ RIP	❑ RA-O	❑ RC	❑ LTM

Media Evaluated (check all that apply):

❑ Groundwater	☒ Sediment (human receptor)
☒ Surface soil	❑ Surface Water (ecological receptor)
☒ Sediment (ecological receptor)	❑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM, or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type: Based on results of the Range Identification and Preliminary Range Assessment (RIPRA) completed in 2001, the Army leased this property for maneuvers, jungle training, and small arms, artillery, and mortar firing between 1943 and 1953. The U.S. Marines leased 1061 acres of the training area in 1953 and continued the leases until 1976. Marine Corps training consisted of small arms fire, shoulder fired rockets, rifle grenades and possibly medium artillery fire. After the Marines investigated and conducted an ordnance clearance in 1976, they reported 187 acres of the WVTA would never be free of duds, practice ordnance, etc.

Description of Pathways for Human and Ecological Receptors From the Remedial Investigation Work Plan, Munitions Response Sites, Waikane Valley Impact Area, Kaneohe, HI of February 2010, potential human receptors include construction workers, and recreational users coming in direct contact or inhaling munitions constituents (MCs) in soil during construction activities. Terrestrial and aquatic wildlife may come in contact with subsurface soil containing MCs.

Description of Receptors (Human and Ecological): See above.

APPENDIX K

Baseline Risk Assessment Risk Calculation Data Sheets

Appendix K Baseline Risk Assessment Risk Calculation Data Sheets

Appendix K-1
ProUCL Results for Soil
Waikane Valley Training Area, Kaneohe, O'ahu, Hawaii

MI Copper

General Statistics			
Number of Valid Observations	30	Number of Distinct Observations	28
Raw Statistics		Log-transformed Statistics	
Minimum	59	Minimum of Log Data	4.078
Maximum	5000	Maximum of Log Data	8.517
Mean	295.7	Mean of log Data	4.85
Median	96.5	SD of log Data	0.889
SD	892.7		
Coefficient of Variation	3.019		
Skewness	5.396		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.256	Shapiro Wilk Test Statistic	0.744
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	572.6	95% H-UCL	278.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	334.1
95% Adjusted-CLT UCL (Chen-1995)	735.3	97.5% Chebyshev (MVUE) UCL	398.1
95% Modified-t UCL (Johnson-1978)	599.4	99% Chebyshev (MVUE) UCL	523.8
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.668	Data do not follow a Discernable Distribution (0.05)	
Theta Star	442.7		
MLE of Mean	295.7		
MLE of Standard Deviation	361.8		
nu star	40.07		
Approximate Chi Square Value (.05)	26.57	Nonparametric Statistics	
Adjusted Level of Significance	0.041	95% CLT UCL	563.8
Adjusted Chi Square Value	25.93	95% Jackknife UCL	572.6
		95% Standard Bootstrap UCL	558.4
Anderson-Darling Test Statistic	4.881	95% Bootstrap-t UCL	2478
Anderson-Darling 5% Critical Value	0.791	95% Hall's Bootstrap UCL	1578
Kolmogorov-Smirnov Test Statistic	0.276	95% Percentile Bootstrap UCL	619.1
Kolmogorov-Smirnov 5% Critical Value	0.167	95% BCA Bootstrap UCL	808.5
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1006
		97.5% Chebyshev(Mean, Sd) UCL	1314
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1917
95% Approximate Gamma UCL	446		
95% Adjusted Gamma UCL	456.9		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	1006

MI Lead

General Statistics			
Number of Valid Observations	30	Number of Distinct Observations	26
Raw Statistics		Log-transformed Statistics	
Minimum	5.6	Minimum of Log Data	1.723
Maximum	140	Maximum of Log Data	4.942
Mean	40.1	Mean of log Data	3.032
Median	14	SD of log Data	1.17

SD	45.57		
Coefficient of Variation	1.136		
Skewness	1.143		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.737	Shapiro Wilk Test Statistic	0.843
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	54.24	95% H-UCL	73.92
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	83.57
95% Adjusted-CLT UCL (Chen-1995)	55.64	97.5% Chebyshev (MVUE) UCL	102.6
95% Modified-t UCL (Johnson-1978)	54.53	99% Chebyshev (MVUE) UCL	139.9
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.821	Data do not follow a Discernable Distribution (0.05)	
Theta Star	48.83		
MLE of Mean	40.1		
MLE of Standard Deviation	44.25		
nu star	49.27		
Approximate Chi Square Value (.05)	34.16	Nonparametric Statistics	
Adjusted Level of Significance	0.041	95% CLT UCL	53.79
Adjusted Chi Square Value	33.43	95% Jackknife UCL	54.24
		95% Standard Bootstrap UCL	53.13
Anderson-Darling Test Statistic	2.117	95% Bootstrap-t UCL	56.75
Anderson-Darling 5% Critical Value	0.781	95% Hall's Bootstrap UCL	54.34
Kolmogorov-Smirnov Test Statistic	0.234	95% Percentile Bootstrap UCL	53.31
Kolmogorov-Smirnov 5% Critical Value	0.165	95% BCA Bootstrap UCL	56.11
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	76.37
		97.5% Chebyshev(Mean, Sd) UCL	92.06
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	122.9
95% Approximate Gamma UCL	57.85		
95% Adjusted Gamma UCL	59.11		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	76.37

Copper			
General Statistics			
Number of Valid Observations	34	Number of Distinct Observations	31
Raw Statistics		Log-transformed Statistics	
Minimum	11	Minimum of Log Data	2.398
Maximum	1300	Maximum of Log Data	7.17
Mean	196.5	Mean of log Data	4.579
Median	84.5	SD of log Data	1.153
SD	291.3		
Coefficient of Variation	1.483		
Skewness	2.658		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.615	Shapiro Wilk Test Statistic	0.969
Shapiro Wilk Critical Value	0.933	Shapiro Wilk Critical Value	0.933
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	281	95% H-UCL	321.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	372.8
95% Adjusted-CLT UCL (Chen-1995)	303	97.5% Chebyshev (MVUE) UCL	454.6

95% Modified-t UCL (Johnson-1978)	284.8	99% Chebyshev (MVUE) UCL	615.5
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.786	Data appear Lognormal at 5% Significance Level	
Theta Star	250		
MLE of Mean	196.5		
MLE of Standard Deviation	221.6		
nu star	53.43		
Approximate Chi Square Value (.05)	37.63	Nonparametric Statistics	
Adjusted Level of Significance	0.0422	95% CLT UCL	278.6
Adjusted Chi Square Value	36.98	95% Jackknife UCL	281
		95% Standard Bootstrap UCL	278.6
Anderson-Darling Test Statistic	1.48	95% Bootstrap-t UCL	348.7
Anderson-Darling 5% Critical Value	0.783	95% Hall's Bootstrap UCL	304.8
Kolmogorov-Smirnov Test Statistic	0.221	95% Percentile Bootstrap UCL	278.7
Kolmogorov-Smirnov 5% Critical Value	0.156	95% BCA Bootstrap UCL	307.3
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	414.2
		97.5% Chebyshev(Mean, Sd) UCL	508.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	693.5
95% Approximate Gamma UCL	278.9		
95% Adjusted Gamma UCL	283.8		
Potential UCL to Use		Use 95% H-UCL	321.6

Lead			
General Statistics			
Number of Valid Observations	34	Number of Distinct Observations	28
Raw Statistics		Log-transformed Statistics	
Minimum	2.2	Minimum of Log Data	0.788
Maximum	300	Maximum of Log Data	5.704
Mean	40.41	Mean of log Data	2.511
Median	8.05	SD of log Data	1.37
SD	79.51		
Coefficient of Variation	1.968		
Skewness	2.578		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.515	Shapiro Wilk Test Statistic	0.825
Shapiro Wilk Critical Value	0.933	Shapiro Wilk Critical Value	0.933
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	63.48	95% H-UCL	63.37
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	68.26
95% Adjusted-CLT UCL (Chen-1995)	69.28	97.5% Chebyshev (MVUE) UCL	84.84
95% Modified-t UCL (Johnson-1978)	64.49	99% Chebyshev (MVUE) UCL	117.4
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.503	Data do not follow a Discernable Distribution (0.05)	
Theta Star	80.37		
MLE of Mean	40.41		
MLE of Standard Deviation	56.99		
nu star	34.19		
Approximate Chi Square Value (.05)	21.82	Nonparametric Statistics	
Adjusted Level of Significance	0.0422	95% CLT UCL	62.84
Adjusted Chi Square Value	21.33	95% Jackknife UCL	63.48
		95% Standard Bootstrap UCL	62.76
Anderson-Darling Test Statistic	4.251	95% Bootstrap-t UCL	80.96
Anderson-Darling 5% Critical Value	0.809	95% Hall's Bootstrap UCL	62.19

Kolmogorov-Smirnov Test Statistic	0.346	95% Percentile Bootstrap UCL	63.48
Kolmogorov-Smirnov 5% Critical Value	0.159	95% BCA Bootstrap UCL	69.07
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	99.84
		97.5% Chebyshev(Mean, Sd) UCL	125.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	176.1
95% Approximate Gamma UCL	63.33		
95% Adjusted Gamma UCL	64.78		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	99.84

2,4,6-Trinitrotoluene

General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	3
Raw Statistics		Log-transformed Statistics	
Minimum	0.2	Minimum of Log Data	-1.609
Maximum	0.37	Maximum of Log Data	-0.994
Mean	0.214	Mean of log Data	-1.558
Median	0.2	SD of log Data	0.17
SD	0.047		
Coefficient of Variation	0.22		
Skewness	3.584		

Warning: There are only 3 Distinct Values in this data
There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values to compute bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.336	Shapiro Wilk Test Statistic	0.345
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.237	95% H-UCL	0.233
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.257
95% Adjusted-CLT UCL (Chen-1995)	0.249	97.5% Chebyshev (MVUE) UCL	0.276
95% Modified-t UCL (Johnson-1978)	0.239	99% Chebyshev (MVUE) UCL	0.314
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	24.42	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.00876		
MLE of Mean	0.214		
MLE of Standard Deviation	0.0433		
nu star	635		
Approximate Chi Square Value (.05)	577.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	0.235
Adjusted Chi Square Value	569.7	95% Jackknife UCL	0.237
		95% Standard Bootstrap UCL	N/A
Anderson-Darling Test Statistic	4.155	95% Bootstrap-t UCL	N/A
Anderson-Darling 5% Critical Value	0.733	95% Hall's Bootstrap UCL	N/A
Kolmogorov-Smirnov Test Statistic	0.469	95% Percentile Bootstrap UCL	N/A
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL	N/A
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.271
		97.5% Chebyshev(Mean, Sd) UCL	0.295
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.344
95% Approximate Gamma UCL	0.235		

95% Adjusted Gamma UCL	0.238		
Potential UCL to Use		Use 95% Student's-t UCL	0.237
		or 95% Modified-t UCL	0.239

2-Amino-4,6-dinitrotoluene

General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	4
Raw Statistics		Log-transformed Statistics	
Minimum	0.2	Minimum of Log Data	-1.609
Maximum	0.28	Maximum of Log Data	-1.273
Mean	0.211	Mean of log Data	-1.563
Median	0.2	SD of log Data	0.107
SD	0.025		
Coefficient of Variation	0.119		
Skewness	2.397		

Warning: There are only 4 Distinct Values in this data
There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values to compute bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.512	Shapiro Wilk Test Statistic	0.518
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.223	95% H-UCL	0.223
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.238
95% Adjusted-CLT UCL (Chen-1995)	0.227	97.5% Chebyshev (MVUE) UCL	0.25
95% Modified-t UCL (Johnson-1978)	0.224	99% Chebyshev (MVUE) UCL	0.273
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	68.3	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.00309		
MLE of Mean	0.211		
MLE of Standard Deviation	0.0255		
nu star	1776		
Approximate Chi Square Value (.05)	1679	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	0.222
Adjusted Chi Square Value	1666	95% Jackknife UCL	0.223
		95% Standard Bootstrap UCL	0.221
Anderson-Darling Test Statistic	3.138	95% Bootstrap-t UCL	0.272
Anderson-Darling 5% Critical Value	0.732	95% Hall's Bootstrap UCL	0.276
Kolmogorov-Smirnov Test Statistic	0.444	95% Percentile Bootstrap UCL	0.222
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL	0.226
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.241
		97.5% Chebyshev(Mean, Sd) UCL	0.254
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.28
95% Approximate Gamma UCL	0.223		
95% Adjusted Gamma UCL	0.225		
Potential UCL to Use		Use 95% Student's-t UCL	0.223
		or 95% Modified-t UCL	0.224

4-Amino-2,6-dinitrotoluene

General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	4
Raw Statistics		Log-transformed Statistics	
Minimum	0.2	Minimum of Log Data	-1.609
Maximum	0.3	Maximum of Log Data	-1.204
Mean	0.212	Mean of log Data	-1.557
Median	0.2	SD of log Data	0.123
SD	0.0298		
Coefficient of Variation	0.14		
Skewness	2.649		

Warning: There are only 4 Distinct Values in this data
There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values to compute bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.496	Shapiro Wilk Test Statistic	0.507
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.227	95% H-UCL	0.226
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.244
95% Adjusted-CLT UCL (Chen-1995)	0.232	97.5% Chebyshev (MVUE) UCL	0.257
95% Modified-t UCL (Johnson-1978)	0.228	99% Chebyshev (MVUE) UCL	0.284
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	50.71	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.00419		
MLE of Mean	0.212		
MLE of Standard Deviation	0.0298		
nu star	1318		
Approximate Chi Square Value (.05)	1235	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	0.226
Adjusted Chi Square Value	1224	95% Jackknife UCL	0.227
		95% Standard Bootstrap UCL	0.225
Anderson-Darling Test Statistic	3.134	95% Bootstrap-t UCL	0.298
Anderson-Darling 5% Critical Value	0.732	95% Hall's Bootstrap UCL	0.287
Kolmogorov-Smirnov Test Statistic	0.439	95% Percentile Bootstrap UCL	0.228
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL	0.235
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.248
		97.5% Chebyshev(Mean, Sd) UCL	0.264
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.294
95% Approximate Gamma UCL	0.227		
95% Adjusted Gamma UCL	0.229		
Potential UCL to Use		Use 95% Student's-t UCL	0.227
		or 95% Modified-t UCL	0.228

Aluminum

General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	11
Raw Statistics		Log-transformed Statistics	

Minimum	34000	Minimum of Log Data	10.43
Maximum	65000	Maximum of Log Data	11.08
Mean	44308	Mean of log Data	10.68
Median	41000	SD of log Data	0.2
SD	9420		
Coefficient of Variation	0.213		
Skewness	1.041		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.885	Shapiro Wilk Test Statistic	0.918
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	48964	95% H-UCL	49293
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	55043
95% Adjusted-CLT UCL (Chen-1995)	49411	97.5% Chebyshev (MVUE) UCL	59702
95% Modified-t UCL (Johnson-1978)	49090	99% Chebyshev (MVUE) UCL	68854
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	20.18	Data appear Normal at 5% Significance Level	
Theta Star	2196		
MLE of Mean	44308		
MLE of Standard Deviation	9863		
nu star	524.7		
Approximate Chi Square Value (.05)	472.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	48605
Adjusted Chi Square Value	465.5	95% Jackknife UCL	48964
		95% Standard Bootstrap UCL	48468
Anderson-Darling Test Statistic	0.551	95% Bootstrap-t UCL	50412
Anderson-Darling 5% Critical Value	0.733	95% Hall's Bootstrap UCL	50003
Kolmogorov-Smirnov Test Statistic	0.227	95% Percentile Bootstrap UCL	48769
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL	49154
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	55696
		97.5% Chebyshev(Mean, Sd) UCL	60623
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	70302
95% Approximate Gamma UCL	49195		
95% Adjusted Gamma UCL	49940		
Potential UCL to Use		Use 95% Student's-t UCL	48964

Antimony			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	11
Raw Statistics		Log-transformed Statistics	
Minimum	0.83	Minimum of Log Data	-0.186
Maximum	56	Maximum of Log Data	4.025
Mean	22.7	Mean of log Data	2.438
Median	12	SD of log Data	1.457
SD	21.28		
Coefficient of Variation	0.938		
Skewness	0.52		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.821	Shapiro Wilk Test Statistic	0.879
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	33.22	95% H-UCL	157.1
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	85.06
95% Adjusted-CLT UCL (Chen-1995)	33.32	97.5% Chebyshev (MVUE) UCL	109.4
95% Modified-t UCL (Johnson-1978)	33.36	99% Chebyshev (MVUE) UCL	157.3
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.713	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	31.85		
MLE of Mean	22.7		
MLE of Standard Deviation	26.89		
nu star	18.53		
Approximate Chi Square Value (.05)	9.773	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	32.41
Adjusted Chi Square Value	8.879	95% Jackknife UCL	33.22
		95% Standard Bootstrap UCL	31.9
Anderson-Darling Test Statistic	0.55	95% Bootstrap-t UCL	35.03
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	30.82
Kolmogorov-Smirnov Test Statistic	0.228	95% Percentile Bootstrap UCL	32.53
Kolmogorov-Smirnov 5% Critical Value	0.245	95% BCA Bootstrap UCL	32.42
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	48.42
		97.5% Chebyshev(Mean, Sd) UCL	59.56
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	81.42
95% Approximate Gamma UCL	43.03		
95% Adjusted Gamma UCL	47.36		
Potential UCL to Use		Use 95% Approximate Gamma UCL	43.03

Barium			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	10
Raw Statistics		Log-transformed Statistics	
Minimum	21	Minimum of Log Data	3.045
Maximum	72	Maximum of Log Data	4.277
Mean	35.46	Mean of log Data	3.481
Median	32	SD of log Data	0.424
SD	16.32		
Coefficient of Variation	0.46		
Skewness	1.106		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.848	Shapiro Wilk Test Statistic	0.882
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	43.53	95% H-UCL	45.59
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	53.75
95% Adjusted-CLT UCL (Chen-1995)	44.39	97.5% Chebyshev (MVUE) UCL	61.74
95% Modified-t UCL (Johnson-1978)	43.76	99% Chebyshev (MVUE) UCL	77.43
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.572	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	7.755		
MLE of Mean	35.46		
MLE of Standard Deviation	16.58		
nu star	118.9		
Approximate Chi Square Value (.05)	94.71	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	42.91

Adjusted Chi Square Value	91.64	95% Jackknife UCL	43.53
		95% Standard Bootstrap UCL	42.45
Anderson-Darling Test Statistic	0.69	95% Bootstrap-t UCL	45.71
Anderson-Darling 5% Critical Value	0.736	95% Hall's Bootstrap UCL	45.31
Kolmogorov-Smirnov Test Statistic	0.26	95% Percentile Bootstrap UCL	43.08
Kolmogorov-Smirnov 5% Critical Value	0.237	95% BCA Bootstrap UCL	44
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	55.19
		97.5% Chebyshev(Mean, Sd) UCL	63.72
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	80.49
95% Approximate Gamma UCL	44.51		
95% Adjusted Gamma UCL	46.01		
Potential UCL to Use		Use 95% Approximate Gamma UCL	44.51

Chromium (assume VI)			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	10
Raw Statistics		Log-transformed Statistics	
Minimum	190	Minimum of Log Data	5.247
Maximum	370	Maximum of Log Data	5.914
Mean	277.7	Mean of log Data	5.61
Median	260	SD of log Data	0.189
SD	52.78		
Coefficient of Variation	0.19		
Skewness	0.402		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.93	Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	303.8	95% H-UCL	307.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	341.5
95% Adjusted-CLT UCL (Chen-1995)	303.5	97.5% Chebyshev (MVUE) UCL	369.1
95% Modified-t UCL (Johnson-1978)	304.1	99% Chebyshev (MVUE) UCL	423.4
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	23.42	Data appear Normal at 5% Significance Level	
Theta Star	11.86		
MLE of Mean	277.7		
MLE of Standard Deviation	57.38		
nu star	608.9		
Approximate Chi Square Value (.05)	552.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	301.8
Adjusted Chi Square Value	545.1	95% Jackknife UCL	303.8
		95% Standard Bootstrap UCL	300.5
Anderson-Darling Test Statistic	0.458	95% Bootstrap-t UCL	305.8
Anderson-Darling 5% Critical Value	0.733	95% Hall's Bootstrap UCL	302.1
Kolmogorov-Smirnov Test Statistic	0.158	95% Percentile Bootstrap UCL	300.8
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL	301.5
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	341.5
		97.5% Chebyshev(Mean, Sd) UCL	369.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	423.3
95% Approximate Gamma UCL	306		
95% Adjusted Gamma UCL	310.2		
Potential UCL to Use		Use 95% Student's-t UCL	303.8

Iron			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	7
Raw Statistics		Log-transformed Statistics	
Minimum	74000	Minimum of Log Data	11.21
Maximum	130000	Maximum of Log Data	11.78
Mean	105077	Mean of log Data	11.55
Median	100000	SD of log Data	0.14
SD	14086		
Coefficient of Variation	0.134		
Skewness	-0.344		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.94	Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	112040	95% H-UCL	113084
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	122963
95% Adjusted-CLT UCL (Chen-1995)	111105	97.5% Chebyshev (MVUE) UCL	130690
95% Modified-t UCL (Johnson-1978)	111978	99% Chebyshev (MVUE) UCL	145866
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	44.02	Data appear Normal at 5% Significance Level	
Theta Star	2387		
MLE of Mean	105077		
MLE of Standard Deviation	15837		
nu star	1145		
Approximate Chi Square Value (.05)	1067	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	111503
Adjusted Chi Square Value	1056	95% Jackknife UCL	112040
		95% Standard Bootstrap UCL	111086
Anderson-Darling Test Statistic	0.488	95% Bootstrap-t UCL	111439
Anderson-Darling 5% Critical Value	0.732	95% Hall's Bootstrap UCL	111511
Kolmogorov-Smirnov Test Statistic	0.167	95% Percentile Bootstrap UCL	111077
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL	110923
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	122106
		97.5% Chebyshev(Mean, Sd) UCL	129474
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	143948
95% Approximate Gamma UCL	112713		
95% Adjusted Gamma UCL	113852		
Potential UCL to Use		Use 95% Student's-t UCL	112040

Nickel			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	12
Raw Statistics		Log-transformed Statistics	
Minimum	63	Minimum of Log Data	4.143
Maximum	160	Maximum of Log Data	5.075
Mean	96.15	Mean of log Data	4.511
Median	74	SD of log Data	0.34
SD	34.37		
Coefficient of Variation	0.357		
Skewness	0.777		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.853	Shapiro Wilk Test Statistic	0.873
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	113.1	95% H-UCL	116.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	135.8
95% Adjusted-CLT UCL (Chen-1995)	114	97.5% Chebyshev (MVUE) UCL	153.1
95% Modified-t UCL (Johnson-1978)	113.5	99% Chebyshev (MVUE) UCL	187
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	7.155	Data appear Lognormal at 5% Significance Level	
Theta Star	13.44		
MLE of Mean	96.15		
MLE of Standard Deviation	35.95		
nu star	186		
Approximate Chi Square Value (.05)	155.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	111.8
Adjusted Chi Square Value	151.5	95% Jackknife UCL	113.1
		95% Standard Bootstrap UCL	111.3
Anderson-Darling Test Statistic	0.768	95% Bootstrap-t UCL	117.5
Anderson-Darling 5% Critical Value	0.734	95% Hall's Bootstrap UCL	111.4
Kolmogorov-Smirnov Test Statistic	0.281	95% Percentile Bootstrap UCL	112.3
Kolmogorov-Smirnov 5% Critical Value	0.237	95% BCA Bootstrap UCL	113
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	137.7
		97.5% Chebyshev(Mean, Sd) UCL	155.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	191
95% Approximate Gamma UCL	115		
95% Adjusted Gamma UCL	118.1		
Potential UCL to Use		Use 95% Student's-t UCL	113.1
		or 95% Modified-t UCL	113.5
		or 95% H-UCL	116.6

Zinc			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	9
Raw Statistics		Log-transformed Statistics	
Minimum	60	Minimum of Log Data	4.094
Maximum	170	Maximum of Log Data	5.136
Mean	91.38	Mean of log Data	4.476
Median	83	SD of log Data	0.278
SD	29		
Coefficient of Variation	0.317		
Skewness	1.773		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.822	Shapiro Wilk Test Statistic	0.916
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	105.7	95% H-UCL	106.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	122
95% Adjusted-CLT UCL (Chen-1995)	108.8	97.5% Chebyshev (MVUE) UCL	135.4

95% Modified-t UCL (Johnson-1978)	106.4	99% Chebyshev (MVUE) UCL	161.7
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	10.11	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	9.038		
MLE of Mean	91.38		
MLE of Standard Deviation	28.74		
nu star	262.9		
Approximate Chi Square Value (.05)	226.4	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	104.6
Adjusted Chi Square Value	221.5	95% Jackknife UCL	105.7
		95% Standard Bootstrap UCL	104.1
Anderson-Darling Test Statistic	0.573	95% Bootstrap-t UCL	113.9
Anderson-Darling 5% Critical Value	0.734	95% Hall's Bootstrap UCL	148.8
Kolmogorov-Smirnov Test Statistic	0.198	95% Percentile Bootstrap UCL	104.8
Kolmogorov-Smirnov 5% Critical Value	0.237	95% BCA Bootstrap UCL	108.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	126.4
		97.5% Chebyshev(Mean, Sd) UCL	141.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	171.4
95% Approximate Gamma UCL	106.1		
95% Adjusted Gamma UCL	108.5		
Potential UCL to Use		Use 95% Approximate Gamma UCL	106.1

MI Copper with Sample WVIA-M-029 Removed			
General Statistics			
Number of Valid Observations	29	Number of Distinct Observations	27
Raw Statistics		Log-transformed Statistics	
Minimum	59	Minimum of Log Data	4.078
Maximum	350	Maximum of Log Data	5.858
Mean	133.4	Mean of log Data	4.723
Median	96	SD of log Data	0.567
SD	88.09		
Coefficient of Variation	0.66		
Skewness	1.438		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.782	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.926	Shapiro Wilk Critical Value	0.926
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	161.3	95% H-UCL	163.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	194.8
95% Adjusted-CLT UCL (Chen-1995)	165	97.5% Chebyshev (MVUE) UCL	222.3
95% Modified-t UCL (Johnson-1978)	162	99% Chebyshev (MVUE) UCL	276.3
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.791	Data do not follow a Discernable Distribution (0.05)	
Theta Star	47.81		
MLE of Mean	133.4		
MLE of Standard Deviation	79.87		
nu star	161.9		
Approximate Chi Square Value (.05)	133.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0407	95% CLT UCL	160.4
Adjusted Chi Square Value	131.9	95% Jackknife UCL	161.3
		95% Standard Bootstrap UCL	159.4
Anderson-Darling Test Statistic	1.449	95% Bootstrap-t UCL	169.7
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	164

Kolmogorov-Smirnov Test Statistic	0.2	95% Percentile Bootstrap UCL	161.2
Kolmogorov-Smirnov 5% Critical Value	0.164	95% BCA Bootstrap UCL	166.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	204.8
		97.5% Chebyshev(Mean, Sd) UCL	235.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	296.2
95% Approximate Gamma UCL	161.9		
95% Adjusted Gamma UCL	163.7		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	204.8

Table K-2
Risk Estimation for Potential Residential Exposure to Soil - ELCR and HI
Soil - DU-3
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Lead	36	5.6E-05	0.0E+00	1.1E-05	0.0E+00	0.0E+00	0.0E+00			1.3E-04	0.0E+00	1.1E-08					
				Sum of Route of Exposure =	**0.0E+00**	**0.0E+00**	**0.0E+00**					**Sum of Route of Exposure =**	**0.0E+00**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.0**	

Table K-3
Risk Estimation for Potential Residential Exposure to Soil - ELCR and HI
Soil - DU-4
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	45	7.0E-05	0.0E+00	1.4E-05	0.0E+00	0.0E+00	0.0E+00			1.6E-04	0.0E+00	1.4E-08	4.1E-01	0.0E+00		0.41	93.4%
Copper	320	5.0E-04	0.0E+00	1.0E-04	0.0E+00	0.0E+00	0.0E+00			1.2E-03	0.0E+00	1.0E-07	2.9E-02	0.0E+00		0.03	6.6%
Lead	110	1.7E-04	0.0E+00	3.5E-05	0.0E+00	0.0E+00	0.0E+00			4.0E-04	0.0E+00	3.5E-08					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**4.4E-01**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.44**	

Table K-4
Risk Estimation for Potential Residential Exposure to Soil - ELCR and HI
Soil - DU-5
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	43	6.7E-05	0.0E+00	1.4E-05	0.0E+00	0.0E+00	0.0E+00			1.6E-04	0.0E+00	1.4E-08	3.9E-01	0.0E+00		3.9E-01	100.0%
Lead	28	4.4E-05	0.0E+00	8.9E-06	0.0E+00	0.0E+00	0.0E+00			1.0E-04	0.0E+00	8.9E-09					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**3.9E-01**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.39**	

Table K-5
Risk Estimation for Potential Residential Exposure to Soil - ELCR and HI
Soil - DU-6
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Copper	350	5.5E-04	0.0E+00	1.1E-04	0.0E+00	0.0E+00	0.0E+00			1.3E-03	0.0E+00	1.1E-07	3.2E-02	0.0E+00		3.2E-02	100.0%
Lead	140	2.2E-04	0.0E+00	4.4E-05	0.0E+00	0.0E+00	0.0E+00			5.1E-04	0.0E+00	4.4E-08					
				Sum of Route of Exposure =	**0.0E+00**	**0.0E+00**	**0.0E+00**					**Sum of Route of Exposure =**	**3.2E-02**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.032**	

Table K-6

Risk Estimation for Potential Residential Exposure to Soil - ELCR and HI

Soil - DU-7

Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	52	8.1E-05	0.0E+00	1.6E-05	0.0E+00	0.0E+00	0.0E+00			1.9E-04	0.0E+00	1.6E-08	4.7E-01	0.0E+00		4.7E-01	51.0%
Copper	5000	7.8E-03	0.0E+00	1.6E-03	0.0E+00	0.0E+00	0.0E+00			1.8E-02	0.0E+00	1.6E-06	4.6E-01	0.0E+00		4.6E-01	49.0%
Lead	130	2.0E-04	0.0E+00	4.1E-05	0.0E+00	0.0E+00	0.0E+00			4.7E-04	0.0E+00	4.1E-08					
				Sum of Route of Exposure =	**0.0E+00**	**0.0E+00**	**0.0E+00**					**Sum of Route of Exposure =**	**9.3E-01**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.93**	

Table K-7
Risk Estimation for Potential Residential Exposure to Soil - ELCR and HI
Soil - DU-9
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Lead	33	5.2E-05	0.0E+00	1.0E-05	0.0E+00	0.0E+00	0.0E+00			1.2E-04	0.0E+00	1.0E-08					
				Sum of Route of Exposure =	**0.0E+00**	**0.0E+00**	**0.0E+00**					**Sum of Route of Exposure =**	**0.0E+00**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.0**	

Table K-8
Risk Estimation for Potential Residential Exposure to Soil - ELCR and HI
Soil - DU-10
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
2,4,6-Trinitrotoluene	0.37	5.8E-07	5.9E-08	1.2E-07	1.7E-08	1.8E-09	0.0E+00	1.9E-08	100.0%	1.4E-06	1.4E-07	1.2E-10	2.7E-03	2.7E-04		3.0E-03	0.6%
2-Amino-4,6-dinitrotoluene	0.28	4.4E-07	8.3E-09	8.9E-08	0.0E+00	0.0E+00	0.0E+00			1.0E-06	1.9E-08	8.9E-11	5.1E-04	9.7E-06		5.2E-04	0.1%
4-Amino-2,6-dinitrotoluene	0.3	4.7E-07	1.3E-08	9.5E-08	0.0E+00	0.0E+00	0.0E+00			1.1E-06	3.1E-08	9.5E-11	5.5E-04	1.6E-05		5.6E-04	0.1%
Antimony	56	8.8E-05	0.0E+00	1.8E-05	0.0E+00	0.0E+00	0.0E+00			2.0E-04	0.0E+00	1.8E-08	5.1E-01	0.0E+00		5.1E-01	99.2%
			Sum of Route of Exposure =		**1.7E-08**	**1.8E-09**	**0.0E+00**				**Sum of Route of Exposure =**		**5.2E-01**	**3.0E-04**	**0.0E+00**		
							Cummulative ELCR =	**1.9E-08**							**Cummulative HI =**	**0.5**	

Table K-9
Risk Estimation for Potential Construction Worker Exposure to Soil - ELCR and HI
Soil - DU-3
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Lead	36	8.8E-07	0.0E+00	1.4E-07	0.0E+00	0.0E+00	0.0E+00			9.3E-06	0.0E+00	1.4E-10					
				Sum of Route of Exposure =	**0.0E+00**	**0.0E+00**	**0.0E+00**					**Sum of Route of Exposure =**	**0.0E+00**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.0**	

Table K-10
Risk Estimation for Potential Construction Worker Exposure to Soil - ELCR and HI
Soil - DU-4
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	45	1.1E-06	0.0E+00	1.8E-07	0.0E+00	0.0E+00	0.0E+00			1.2E-05	0.0E+00	1.8E-10	2.9E-02	0.0E+00		2.9E-02	93.4%
Copper	320	7.8E-06	0.0E+00	1.3E-06	0.0E+00	0.0E+00	0.0E+00			8.3E-05	0.0E+00	1.3E-09	2.1E-03	0.0E+00		2.1E-03	6.6%
Lead	110	2.7E-06	0.0E+00	4.4E-07	0.0E+00	0.0E+00	0.0E+00			2.8E-05	0.0E+00	4.4E-10					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**3.1E-02**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.031**	

Table K-11
Risk Estimation for Potential Construction Worker Exposure to Soil - ELCR and HI
Soil - DU-5
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	43	1.0E-06	0.0E+00	1.7E-07	0.0E+00	0.0E+00	0.0E+00			1.1E-05	0.0E+00	1.7E-10	2.8E-02	0.0E+00		2.8E-02	100.0%
Lead	28	6.8E-07	0.0E+00	1.1E-07	0.0E+00	0.0E+00	0.0E+00			7.2E-06	0.0E+00	1.1E-10					
				Sum of Route of Exposure =	**0.0E+00**	**0.0E+00**	**0.0E+00**					**Sum of Route of Exposure =**	**2.8E-02**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.028**	

Table K-12
Risk Estimation for Potential Construction Worker Exposure to Soil - ELCR and HI
Soil - DU-6
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Copper	350	8.5E-06	0.0E+00	1.4E-06	0.0E+00	0.0E+00	0.0E+00			9.0E-05	0.0E+00	1.4E-09	2.3E-03	0.0E+00		2.3E-03	100.0%
Lead	140	3.4E-06	0.0E+00	5.6E-07	0.0E+00	0.0E+00	0.0E+00			3.6E-05	0.0E+00	5.6E-10					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**2.3E-03**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.0023**	

Table K-13
Risk Estimation for Potential Construction Worker Exposure to Soil - ELCR and HI
Soil - DU-7
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	52	1.3E-06	0.0E+00	2.1E-07	0.0E+00	0.0E+00	0.0E+00			1.3E-05	0.0E+00	2.1E-10	3.4E-02	0.0E+00		3.4E-02	51.0%
Copper	5000	1.2E-04	0.0E+00	2.0E-05	0.0E+00	0.0E+00	0.0E+00			1.3E-03	0.0E+00	2.0E-08	3.2E-02	0.0E+00		3.2E-02	49.0%
Lead	130	3.2E-06	0.0E+00	5.2E-07	0.0E+00	0.0E+00	0.0E+00			3.4E-05	0.0E+00	5.2E-10					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**6.6E-02**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.066**	

Table K-14
Risk Estimation for Potential Construction Worker Exposure to Soil - ELCR and HI
Soil - DU-9
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Lead	33	8.0E-07	0.0E+00	1.3E-07	0.0E+00	0.0E+00	0.0E+00			8.5E-06	0.0E+00	1.3E-10					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**0.0E+00**	**0.0E+00**	**0.0E+00**		
						Cummulative ELCR =		**0.0E+00**						**Cummulative HI =**		**0.0**	

Table K-15
Risk Estimation for Potential Construction Worker Exposure to Soil - ELCR and HI
Soil - DU-10
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
2,4,6-Trinitrotoluene	0.37	9.0E-09	5.8E-10	1.5E-09	2.7E-10	1.7E-11	0.0E+00	2.9E-10	100.0%	9.6E-08	6.1E-09	1.5E-12	1.9E-04	1.2E-05		2.0E-04	0.6%
2-Amino-4,6-dinitrotoluene	0.28	6.8E-09	8.2E-11	1.1E-09	0.0E+00	0.0E+00	0.0E+00			7.2E-08	8.7E-10	1.1E-12	3.6E-05	4.3E-07		3.7E-05	0.1%
4-Amino-2,6-dinitrotoluene	0.3	7.3E-09	1.3E-10	1.2E-09	0.0E+00	0.0E+00	0.0E+00			7.7E-08	1.4E-09	1.2E-12	3.9E-05	7.0E-07		3.9E-05	0.1%
Antimony	56	1.4E-06	0.0E+00	2.2E-07	0.0E+00	0.0E+00	0.0E+00			1.4E-05	0.0E+00	2.2E-10	3.6E-02	0.0E+00		3.6E-02	99.2%
			Sum of Route of Exposure =		**2.7E-10**	**1.7E-11**	**0.0E+00**				**Sum of Route of Exposure =**		**3.6E-02**	**1.3E-05**	**0.0E+00**		
							Cummulative ELCR =	**2.9E-10**							**Cummulative HI =**	**0.036**	

Table K-16
Risk Estimation for Potential Recreational Exposure to Soil - ELCR and HI
Soil - DU-3
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Lead	36	2.0E-06	0.0E+00	2.8E-07	0.0E+00	0.0E+00	0.0E+00			2.8E-05	0.0E+00	2.8E-10					
				Sum of Route of Exposure =	**0.0E+00**	**0.0E+00**	**0.0E+00**					**Sum of Route of Exposure =**	**0.0E+00**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.0**	

Table K-17
Risk Estimation for Potential Recreational Exposure to Soil - ELCR and HI
Soil - DU-4
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	45	2.5E-06	0.0E+00	3.5E-07	0.0E+00	0.0E+00	0.0E+00			3.5E-05	0.0E+00	3.5E-10	8.8E-02	0.0E+00		8.8E-02	93.4%
Copper	320	1.8E-05	0.0E+00	2.5E-06	0.0E+00	0.0E+00	0.0E+00			2.5E-04	0.0E+00	2.5E-09	6.3E-03	0.0E+00		6.3E-03	6.6%
Lead	110	6.2E-06	0.0E+00	8.6E-07	0.0E+00	0.0E+00	0.0E+00			8.6E-05	0.0E+00	8.6E-10					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**9.5E-02**	**0.0E+00**	**0.0E+00**		

Cummulative ELCR = 0.0E+00

Cummulative HI = 0.095

Table K-18
Risk Estimation for Potential Recreational Exposure to Soil - ELCR and HI
Soil - DU-5
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	43	2.4E-06	0.0E+00	3.4E-07	0.0E+00	0.0E+00	0.0E+00			3.4E-05	0.0E+00	3.4E-10	8.4E-02	0.0E+00		8.4E-02	100.0%
Lead	28	1.6E-06	0.0E+00	2.2E-07	0.0E+00	0.0E+00	0.0E+00			2.2E-05	0.0E+00	2.2E-10					
				Sum of Route of Exposure =	**0.0E+00**	**0.0E+00**	**0.0E+00**					**Sum of Route of Exposure =**	**8.4E-02**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.084**	

Table K-19
Risk Estimation for Potential Recreational Exposure to Soil - ELCR and HI
Soil - DU-6
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Copper	350	2.0E-05	0.0E+00	2.7E-06	0.0E+00	0.0E+00	0.0E+00			2.7E-04	0.0E+00	2.7E-09	6.9E-03	0.0E+00		6.9E-03	100.0%
Lead	140	7.8E-06	0.0E+00	1.1E-06	0.0E+00	0.0E+00	0.0E+00			1.1E-04	0.0E+00	1.1E-09					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**6.9E-03**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.0069**	

Table K-20
Risk Estimation for Potential Recreational Exposure to Soil - ELCR and HI
Soil - DU-7
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Antimony	52	2.9E-06	0.0E+00	4.1E-07	0.0E+00	0.0E+00	0.0E+00			4.1E-05	0.0E+00	4.1E-10	1.0E-01	0.0E+00		1.0E-01	51.0%
Copper	5000	2.8E-04	0.0E+00	3.9E-05	0.0E+00	0.0E+00	0.0E+00			3.9E-03	0.0E+00	3.9E-08	9.8E-02	0.0E+00		9.8E-02	49.0%
Lead	130	7.3E-06	0.0E+00	1.0E-06	0.0E+00	0.0E+00	0.0E+00			1.0E-04	0.0E+00	1.0E-09					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**2.0E-01**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.200**	

Table K-21
Risk Estimation for Potential Recreational Exposure to Soil - ELCR and HI
Soil - DU-9
Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Lead	33	1.9E-06	0.0E+00	2.6E-07	0.0E+00	0.0E+00	0.0E+00			2.6E-05	0.0E+00	2.6E-10					
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**0.0E+00**	**0.0E+00**	**0.0E+00**		
							Cummulative ELCR =	**0.0E+00**							**Cummulative HI =**	**0.0**	

Table K-22

Risk Estimation for Potential Recreational Exposure to Soil - ELCR and HI

Soil - DU-10

Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
2,4,6-Trinitrotoluene	0.37	2.1E-08	1.3E-08	2.9E-09	6.2E-10	3.8E-10	0.0E+00	1.0E-09	100.0%	2.9E-07	1.8E-07	2.9E-12	5.8E-04	3.5E-04		9.3E-04	0.8%
2-Amino-4,6-dinitrotoluene	0.28	1.6E-08	1.8E-09	2.2E-09	0.0E+00	0.0E+00	0.0E+00			2.2E-07	2.5E-08	2.2E-12	1.1E-04	1.3E-05		1.2E-04	0.1%
4-Amino-2,6-dinitrotoluene	0.3	1.7E-08	2.9E-09	2.3E-09	0.0E+00	0.0E+00	0.0E+00			2.4E-07	4.0E-08	2.3E-12	1.2E-04	2.0E-05		1.4E-04	0.1%
Antimony	56	3.1E-06	0.0E+00	4.4E-07	0.0E+00	0.0E+00	0.0E+00			4.4E-05	0.0E+00	4.4E-10	1.1E-01	0.0E+00		1.1E-01	98.9%
				Sum of Route of Exposure =	**6.2E-10**	**3.8E-10**	**0.0E+00**					**Sum of Route of Exposure =**	**1.1E-01**	**3.9E-04**	**0.0E+00**		
							Cummulative ELCR =	**1.0E-09**							**Cummulative HI =**	**0.1**	

Table K-23

Risk Estimation for Potential Recreational Exposure to Sediment- ELCR and HI

Sediment

Waikane Valley Impact Area

Analyte Name	Exposure Point Concentration (mg/kg)	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (ug/m^3)	Oral Risk	Dermal Risk	Inhale Risk	Total ELCR	Percent Contribution	Intake Oral (mg/kg*day)	Intake Dermal (mg/kg*day)	Intake Inhale (mg/m^3)	Oral HQ	Dermal HQ	Inhale HQ	Total HQ	Percent Contribution
Cobalt	48	2.7E-06	0.0E+00		0.0E+00	0.0E+00				3.8E-05	0.0E+00		1.3E-01	0.0E+00		1.3E-01	100.0%
			Sum of Route of Exposure =		**0.0E+00**	**0.0E+00**	**0.0E+00**				**Sum of Route of Exposure =**		**1.3E-01**	**0.0E+00**	**0.0E+00**		
						Cummulative ELCR =		**0.0E+00**							**Cummulative HI =**	**0.1**	

APPENDIX L

Natural Resources Survey

AECOS No. 1229B

Natural resources surveys in advance of an explosives ordnance disposal operation in the Waikane Valley Impact Area, MCBH

Prepared by:

AECOS Inc.
45-939 Kamehameha Hwy, Suite 104
Kāneʻohe, Hawaiʻi 96744-3221

October 18, 2010

Natural resources surveys in advance of an explosives ordnance disposal operation in the Waikane Valley Impact Area, MCBH[1]

October 18, 2010 *AECOS* No. 1229B

Eric B. Guinther, Dr. Steven L. Montgomery[2], and Reginald E. David[3]
AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāne'ohe , Hawai'i 96744
Phone: (808) 234-7770 Fax: (808) 234-7775 Email: guinther@aecos.com

Introduction

In March-April 2010, biologists conducted surveys within the Marine Corps Base Hawaii (MCBH), Waikane Valley Impact Area. These natural resources surveys were undertaken in advance of munitions clean-up operations in order to discover whether sensitive biological resources were present in the area that might require special considerations. The munitions clean-up (explosives ordnance disposal or EOD) operation conducted by USA Environmental would include, within specified areas, clearing of vegetation to detect, and (if necessary) controlled detonations to destroy in place, military munitions fired into target areas during training exercises. The broad purpose of the surveys was to ascertain what restrictions might be imposed upon the clean-up effort to avoid adverse impacts to sensitive biota (legally protected or other rare, native organisms) and to establish whether any federally listed plant or animal species or significant areas of native vegetation occur in the areas proposed for clean-up operations.

The Waikane Valley Impact Area is a 187-ac (76-ha) parcel (MCBH parcel) of land owned by MCBH and located in Waikāne Valley about 10 miles northwest of Marine Corps Base Hawaii, Kaneohe Bay. (Fig. 1) The parcel (Fig. 2) is bounded on the northern, southern, and western sides by undeveloped forest

[1] Prepared for USA Environmental.

[2] Montane Matters, 94-610 Palai Street, Waipahu.

[3] Rana Biological Consulting, Inc., PO Box 1371, Kailua-Kona, Hawai'i.

land owned by two corporations: Kualoa Ranch and SMF Enterprises. The area on its eastern boundary comprises the Waikāne Nature Preserve owned by the City and County of Honolulu, an area once proposed for development as a golf course. The study site was included in the now inactive Waikane Valley Training Area, which originally encompassed approximately 1060 ac (429 ha) of land leased by the Marine Corps from 1953 to 1976. During this period, the area was used for training of military personnel, including live-fire training.

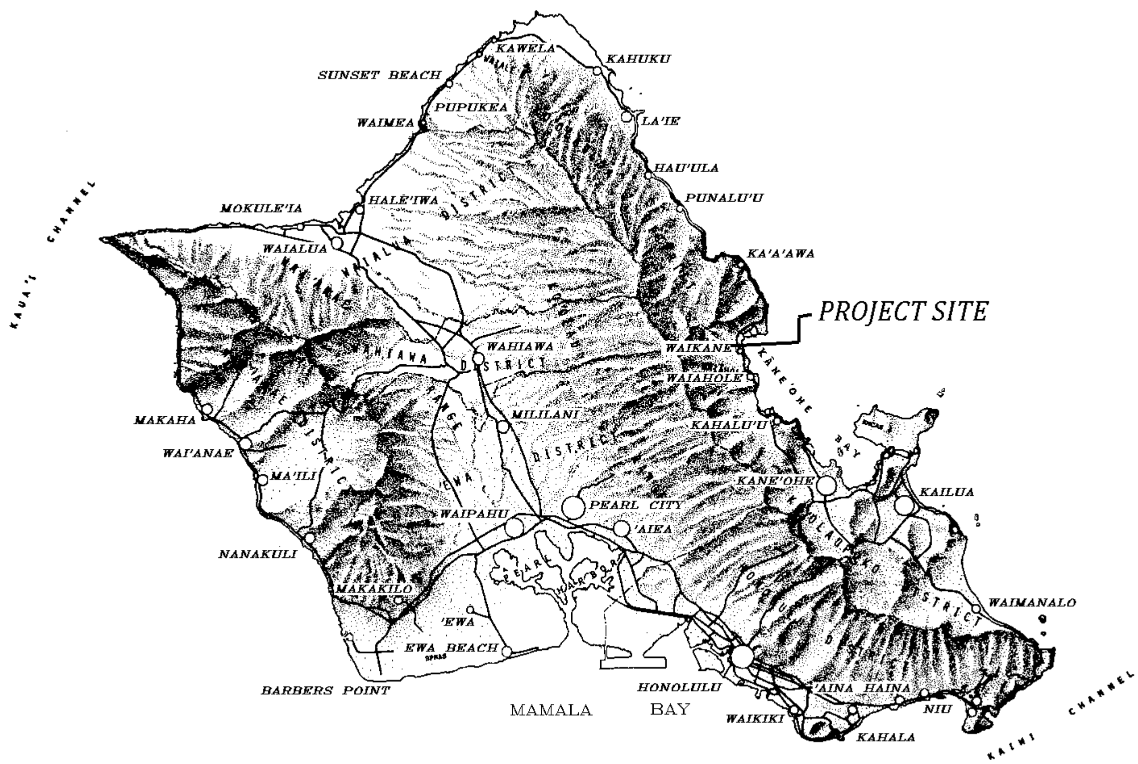


Figure 1. Map of Oʻahu showing location of
Waikāne Valley on the northeast (windward) coast.

Because of the unknown amounts of unexploded ordnance still present, the area has been closed to the public. The land was purchased thorough condemnation in 1994 because of the difficulty of returning the site to a condition that would be safe for private use. The training area, excluding the MCBH parcel (Fig. 2), is on the Formerly Used Defense Site (FUDS) funding list for ordnance clean-up (Tuggle and Wilcox, 1998), while the MCBH parcel (i.e., the project area) is listed for clean-up under the Department of the Navy Installation Restoration Program.

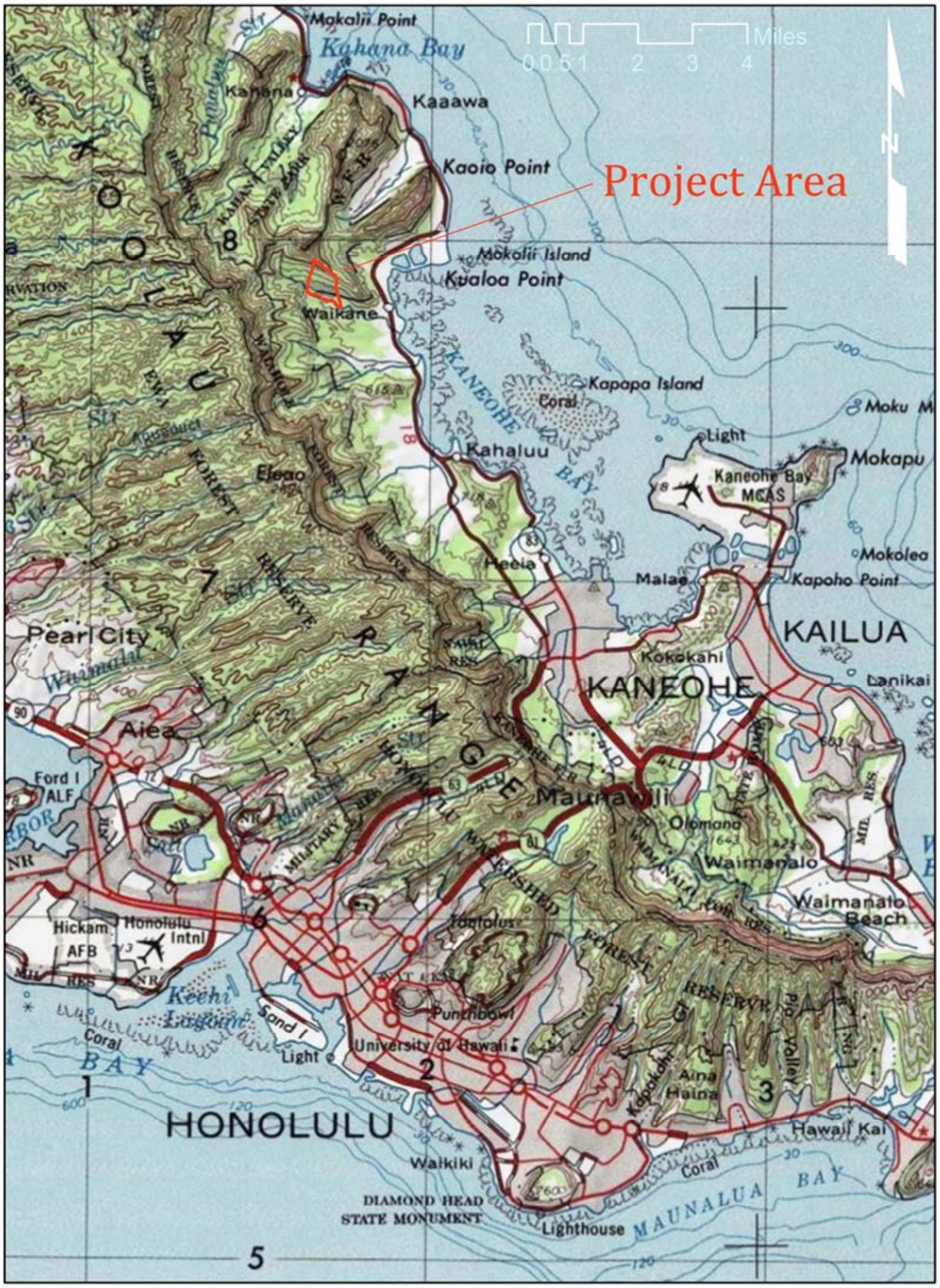


Figure 2. Map of East Oʻahu showing location of
survey area (project area outlined in red) in Waikāne Valley.

Based upon pertinent literature and field surveys undertaken initially in 2003 (Guinther et al., 2003; Whistler, 2003), the vegetation types and plant species encountered were recorded, and a qualitative description of the vegetation and checklist of species present, were prepared. In addition to the field surveys, team biologists assessed the probability of any usage of the survey area by listed animal species given the habitats currently present within the site.

Methods

General Survey Methods — The field team comprised three biologists: Eric Guinther (ecology, botany, and stream biota), Reginald David (vertebrates), and Dr. Steven Montgomery (invertebrates and native plants). The field effort was initially set up to entail two phases. Phase 1 looked at four specific sites—suspected training area target sites designated Areas of Concern (AOC)—as directed by the prime contractor, USA Environmental. The biologists, accompanied by an EOD escort, inspected each of four AOC (shown in Fig. 3), as each of the rectangular areas was potentially to be cleared of any vegetation interfering with magnetometer sweeps and spent ordinance removal. Navigation was aided by a Garmin[4] GPS unit preloaded with the AOC boundaries for the Phase 1 surveys. The Phase 2 surveys were to encompass the remainder of the 187-ac (76-ha) site, except where *uluhe* fern was too thick to penetrate or upper slopes were too steep to safely negotiate. In fact, it proved far more efficient to undertake both "phase" goals more or less simultaneously by moving from area to area along routes that took in the variety of environments present in this part of the Valley. The routes taken on five separate survey dates (Feb. 25, Mar. 4, Mar 5, Mar. 31, and Apr. 8) by the field team are shown in Fig. 3 as plotted by a Garmin 60CSx GPS unit.

A one-time survey cannot provide a total picture of the wildlife utilizing any given area. Certain species will not be detected for one reason or another, rarity being the commonest reason. Seasonal variations in populations coupled with seasonal usage and availability of resources will cause different animal distribution patterns throughout a year or, in fact, over a number of years. Monitoring at a different time of the year, or for a longer period of time would likely produce a longer or different species list. Some plants are annuals and might be unobserved during the driest months of the year (although present as seeds). Plants with pronounced seasonal flowering or fruiting might be missed—especially if uncommon and in a forest setting—if not in flower or fruit

[4] A Trimble GeoXT, preloaded with site coordinates for the Phase 1 surveys, proved inadequate for the task: the preloaded map would not project correctly, and the GPS unit (lacking an external antenna) recorded positions in the heavily forested, steep gulches too infrequently to be of any service.

at the time of the survey. Arthropod life cycles and seasonal changes, especially plant growth after heavy rains, would change the arthropod species collected. Many arthropods time their emergence and breeding to overlap or follow seasonal weather or to coincide with growth spurts of an important plant food.

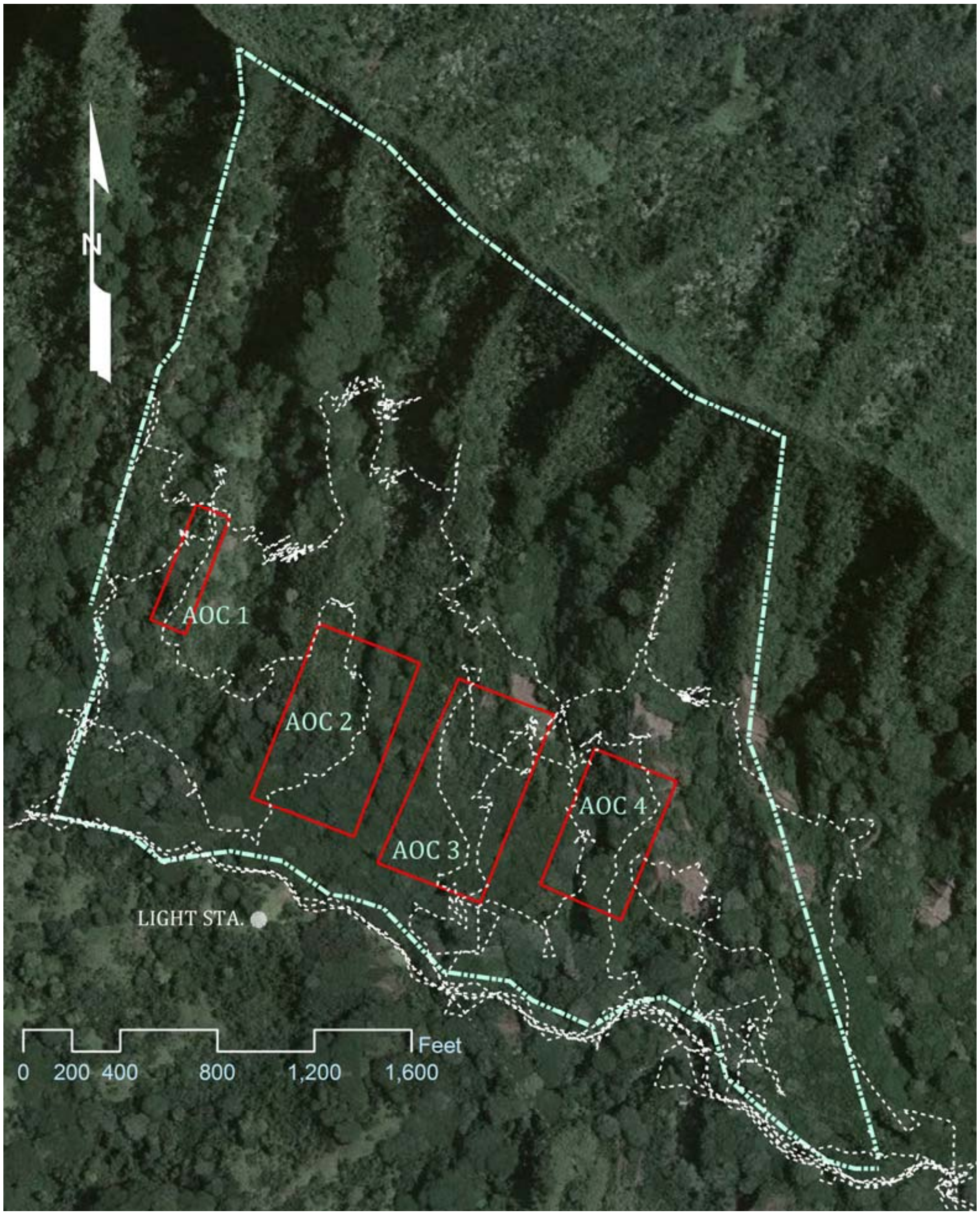


Figure 3. Survey routes from GPS recording superimposed on a satellite image of northeast Waikāne Valley with Waikane Valley Impact Area outlined (heavy dash-dot line) and the four AOCs indicated (red rectangles). Arthropod light station location also shown.

Botanical Survey Methods — The botanical survey involved traversing the area, recording notes on the vegetation, and developing a list of all plant species encountered. The routes taken were recorded using a Garmin GPS, as were specific GPS locations of plants of particular interest. Although use of binoculars was proposed to fill in observations in areas that could not be reached due to terrain constraints, this approach proved of little utility. Climbing upwards along ridgelines to these higher elevations provided access well above the EOD work areas, and looking downward into gulch areas was useful for identifying canopy species. However, looking upwards along cliff faces did not permit identification of other than some tree species and was limited by restricted views through openings between trees. Anyway, the field surveys were able to cover terrain too rugged for the clean-up operations and accomplished the primary purpose of establishing the extent of sensitive biological resources within all of the property impacted by the clean-up project.

The nomenclature of the higher plants follows that of Wagner, Herbst, & Sohmer (1990) and Wagner & Herbst (1999) for native and naturalized plants and Palmer (2003) for ferns. Other plants (ornamentals) follow names given in Staples and Herbst (2005).

Aquatic Biota — No specific surveys of aquatic biota were made for this report, only incidental observations on side streams within or between the AOCs. A survey of aquatic environments in the MCBH parcel was previously conducted by Eric Guinther and Susan Burr (Guinther, et al., 2003).

Invertebrates Survey Methods — During Phase 1, Dr. Montgomery accompanied Eric Guinther and the EOD support personnel, visiting each of the four AOCs (Fig. 2). Both biologists are competent at identifying native plants, and many of the native plants encountered were inspected by Montgomery for native insects. The invertebrates survey included visual identification during day and night sampling of invertebrates. Day sampling focused on the more upland areas of the Waikane Valley Impact Area. This focus was determined by the presence of a higher percentage of native host plants on the upper slopes. The survey was conducted by walking along ridge trails, with stops at locations where native host plants or a forest pocket made collecting success likely.

Emphasis was on arthropods, particularly the discovery of any native species extant in the survey area and those having legal status under the Endangered Species Act and listed by Federal or State agencies (USFWS. 2010; DLNR 1998). Medically important invertebrates, which could present a health risk or danger to project personnel, were also noted if observed. Additionally, a review of relevant literature was made. Names authority for invertebrates discussed in the text and text tables are Hawaii Biological Survey (2002), Nishida (2002), Zimmerman (1948-80), and Zimmerman (2001).

A location on a prominent hill opposite the survey area was selected for night collecting; restrictions on unaccompanied access precluded surveying within the Waikane Valley Impact Area. Previous night collections were made in this area by Dr. Montgomery on June 4 and June 10-11, 2003 (Guinther, et al., 2003). The recent night survey was conducted on May 12-13, 2010, using both MV and UV light bulbs. The light was functioning from sunset (7:00 PM) on May 12 until twilight (5:30 AM) on May 13[5]. This night was chosen for the survey as the moon did not rise until 5:28 AM on May 13, when it was a waning crescent with only 2% of the moon's visible disk illuminated. The night was overcast (although no rain fell) and neither stars nor the sliver of moon distracted interest from the light. The light was positioned above and across from the survey area and clearly visible to night insects in the survey area (Fig. 3). In short, conditions for the survey were very favorable and the results can be considered an appropriate cross section of species present.

<u>Avian Survey Methods</u> — The time period between the start of the field surveys and the proposed start of clean-up operations was short, and unfortunately marked by a nearly continuous period of strong winds and generally rainy weather. Avian station counts—planned as part of the natural resources survey—could not be conducted under such conditions. The avian biologist attempted to undertake bird observations on several different dates, but poor conditions precluded obtaining useful data. Previously (on June 4, 2003), R. David was successful in completing nine avian count stations within the study area and data from this earlier survey are included in the present report. Additional information on sensitive bird species in Waikāne Valley is presented in the discussion section.

<u>Mammalian Survey Methods</u> — All observations of mammalian species were of an incidental nature. With the exception of the endemic (i.e. native and unique to Hawaiʻi), endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or *ʻōpeʻapeʻa*, as it is known in Hawaiian, all terrestrial mammals currently found on the island of Oʻahu are alien species (i.e., introduced to Hawaiʻi by humans). Most are ubiquitous; no trapping program was proposed or undertaken to quantify the use of the study site by alien mammalian species. The survey of mammals was limited to visual and auditory detection, coupled with observation of scat, tracks and other animal sign. A running tally was kept of all mammals observed and heard while within the boundaries of the study

[5] URL - http://www.usno.navy.mil/USNO/astronomical-applications/data-services/rs-one-day-us

site in 2010. Mammal scientific names follow *Mammals in Hawaii* (Tomich, 1986).

Results

Waikāne is one of several valleys with watersheds draining into the northern part of Kāneʻohe Bay. All of these windward valleys, from Kāneʻohe in the south to Hakipuʻu in the north, support lush vegetation owing to an abundance of water, and most have figured prominently in agriculture from the earliest days of Polynesian settlement of the Hawaiian Islands. However in modern times, the southernmost valleys have seen substantial urban development and this development of mostly residential neighborhoods has spread northward from Kāneʻohe, today leaving as distinctly rural in character only Waiāhole, Waikāne, Hakipuʻu and Kualoa of the nine ahupuaʻa bordering Kāneʻohe Bay.

Vegetation

<u>Previous Botanical Surveys</u> — Prior to 2003, no comprehensive botanical survey had been carried out on the site. Tuggle and Wilcox prepared a strategic management planning guidance document for MCBH Environmental Department, including the MCBH parcel at Waikāne Valley (Tuggle and Wilcox, 1998). The MCBH Integrated Natural Resources Management Plan/ Environmental Assessment (MCBH INRMP/EA; Drigot et. al., 2001) contains a section covering Waikāne Valley, which included a brief description of the vegetation, citing the Tuggle and Wilcox document and others. It notes that the site was densely wooded and dominated by alien species:

> Along the ridge lines in the northern portion of the property, the vegetation consists of open shrubland and broomsedge (*Andropogon virginicus*) grassland. Native vegetation found in the area includes *ʻohiʻa* (*Metrosideros polymorpha*), *hala* (*Pandanus tectorius*), ʻakia (*Wikstroemia uva-ursi* [this is actually *Wikstroemia oahuensis*]), *pukiawe* (*Styphelia tameiameiae*), *naupaka kuahiwi* (*Scaevola gaudichaudiana*), *ʻulei* (*Osteomeles anthyllidifolia*) and *hau* (*Hibiscus tiliaceus*). The area is heavily covered with invasive vegetation, including strawberry guava (*Psidium cattleianum*), Christmas berry (*Schinus terebinthifolius*), Java plum (*Syzygium cumini*), and albizia ([*Falcateria moluccana*]). Understory plants in wooded areas include basket grass (*Oplismenus hirtellus*), hairy sword fern ([*Ne*]*phrolepis multiflora*), and wood fern (*Christella parasitica*). The southeastern portion of the property is largely overgrown by California grass (*Brachiaria mutica*).

The Appendix volume of the MCBH INRMP/EA (Drigot, et al., 2001) listed 37 plant species found in the area, ten of these native. Only one of these native species was not found during the 2003 or the present survey, *Wikstroemia uva-ursi*, but this is almost certainly a misidentification of *Wikstroemia oahuensis*, which was found during the 2003 and 2010 surveys. None of the native species is on the U. S. Fish and Wildlife list of threatened and endangered plant species (U.S. Fish and Wildlife Service, 2005, 2010).

A comprehensive botanical survey was undertaken on the adjacent Waikane Nature Preserve when that site was being considered development as a golf course (Nagata, 1988; Char, 1990). However, that property is closer to the coast and even more disturbed than the Waikane Valley Impact Area. A survey of the Waikane Valley Training Area was conducted in mid-2005 (Guinther, et al., 2005), although this survey to assess establishing a jungle warfare training site specifically excluded the Waikane Valley Impact Area.

The abundant rainfall received by this windward valley supports lush vegetation. As is typical for all of windward Oʻahu, the flora of the highly disturbed lowlands is very much dominated by non-native plant species, and natives tend to increase with elevation and distance inland from the shoreline. The lower valley also shows considerable disturbance with unimproved roads, extensive off-road vehicle use, and past agricultural activities. An exception to the generalization that native forest ecosystem is more or less intact in the uplands occurs in Waikāne in that extending well back into the valley, non-native weeds, planted ornamentals, and forestry plantings occur along the access routes and in areas where residences were once located (as at and around Waikāne Camp). The contour trail—at around the 800 ft (240 m) above sea level (ASL), originally developed for the water ditch/tunnel inspectors to travel from adit to adit, and now essentially abandoned—is marked by regularly spaced plantings of exotic trees.

The original human disturbance in the Valley was agriculture: the alluvial areas of the valley were extensively used for taro cultivation. The waters of Waikāne have long been celebrated in Hawaiian traditional lore, and the streams that cut across the valley floor made the site ideal for wet taro cultivation. The Waikāne taro flats, listed on the National Register, have been described as some of the best preserved *loʻi* in Oʻahu. At the end of the 19th century, the *loʻi* were converted to rice fields. Alien species, such as Java plum (*Syzygium cumini*) and Moluccan albizia (*Falcateria moluccana*), were apparently planted in the area sometime later in order to restore the land, but these species now entirely dominate most of the lower part of the site. Since the end of active military activity, little has been done to the study site other than some agriculture by local farmers. Signs of these activities include abandoned agricultural plots, persistent cultivated plants (several species of ornamental ginger and heliconia), and rusting abandoned vehicles and farm equipment.

Vegetation Mapping — Utilizing the field observations made during the present survey and satellite images of the survey area, a vegetation map of the MCBH parcel was prepared (Fig. 4). Whistler (Guinther et al., 2003; Whistler, 2003) described, but did not map, the vegetation as he observed it comprising four plant communities, these based upon structure and dominant species present. The first two of these, Managed Land Vegetation and Secondary Forest, cover most of the flat to moderately sloping ground near Waikāne Stream and towards the east end of the study site, and are on land that has been extensively disturbed in the past. These two communities are entirely dominated by alien plant species, except where either *hau* (*Hibiscus tiliaceus*) or *hala* (*Pandanus tectorius*) are locally abundant. Managed Land is somewhat of an oxymoron for the MCBH parcel for the reason that the site is fenced and access prohibited; thus, "management" (presumably some form of agriculture) of the land in the sense intended by Whistler is not occurring. In our vegetation map, Secondary Forest is split into Riparian Forest and Upland Forest (UFo).

Riparian Forest (RFo) is associated with Waikāne Valley bottom land and dominated by albizia (*Falcateria moluccana*) and—in areas particularly close to streams and in former *lo'i—hau.* Native *hala* is locally abundant in side valleys and steep interfluvial areas, as is Java plum (*Syzygium cumini*) in areas of deep soil. Mango (*Mangifera indica*) and bingabing (*Macaranga mappa*) are present. The dense shade of the trees tends to limit undergrowth in the riparian forest. Scattered openings in the crown support various species of ornamental heliconia (*Heliconia* spp.) and ginger (*Alpinia purpurata* and *Costus woodsonii*), as well as Macarthur palm (*Ptychosperma macarthurii*). These areas of plantings associated with 20th Century settlement and agriculture likely correspond to Whistler's "Managed Land" and are found on the lowlands in the eastern part of the survey area.

Riparian forest is, by definition, associated with streams. In the project area, forested land extends upslope as Upland Forest (UFo) that may occupy either smaller fluvial features, gulch margins, or even interfluvial ridges. As with the riparian forest, these are secondary forests, dominated in some cases by albizia, although in most occurrences having a diversity of species such as octopus tree (*Shefflera actinophylla*), *hala*, moho (*Heliocarpus popayanensis*), Java Plum, mango, and *koa* (*Acacia koa*). Abundant understory shrubs are shoebutton ardisia (*Ardisia elliptica*) and strawberry guava (*Psidium cattleianum*).

Whistler (2003) described two other communities in the project area: *'Ōhi'a* Scrub and *Koa*/*Uluhe* Woodland, occurring on steeper, more exposed slopes of the ridges that extend up to the northern ridge line of the valley. These vegetation communities are characterized by a mix of native and non-native

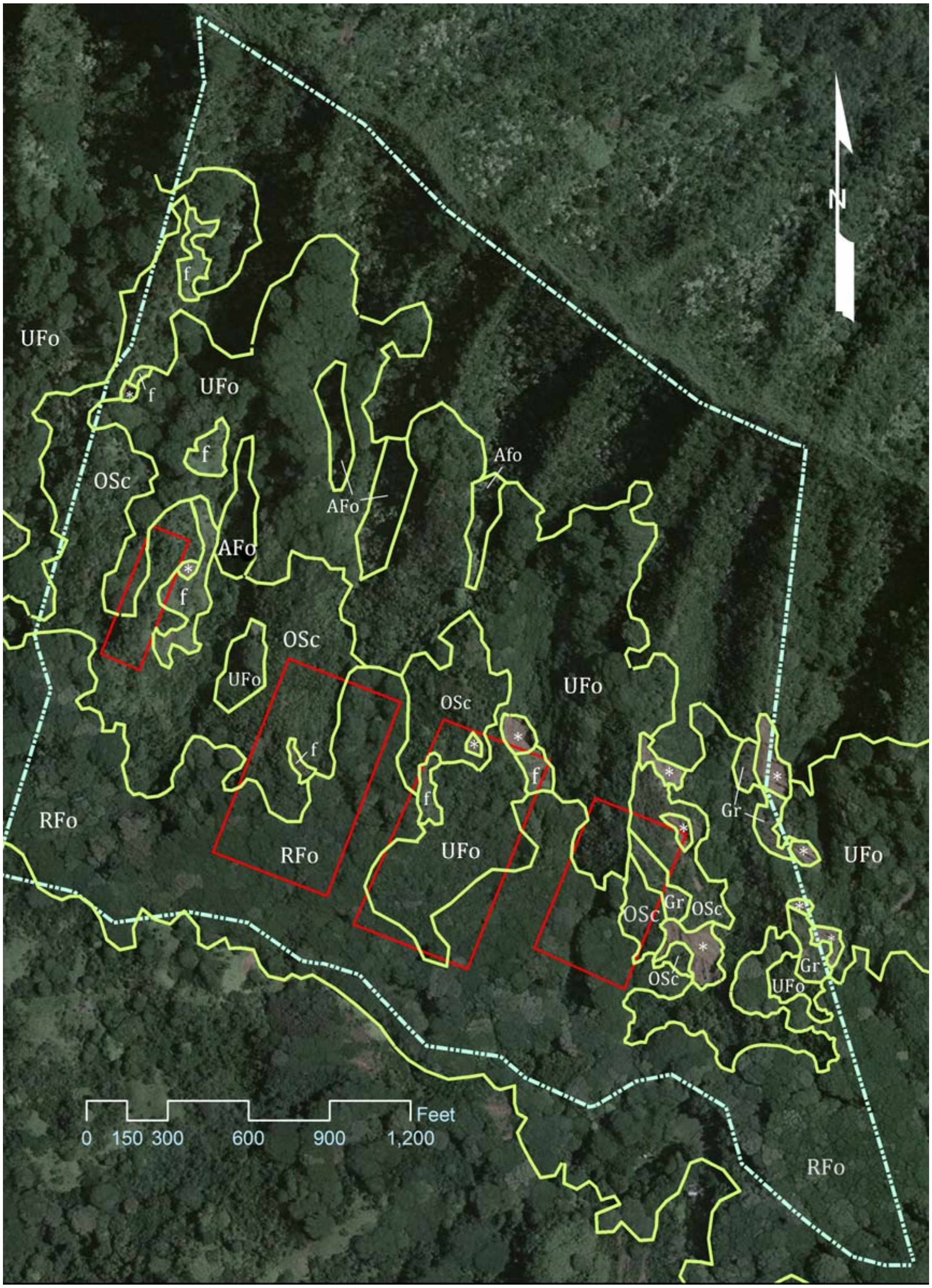


Figure 4. Vegetation map of the project area in Waikāne Valley.
See text and Table 1 for legend.

plant species. The proportion of native species increases with elevation in the survey area. The *Ōhiʻa* Scrub (OSc) is characterized by scattered, short-statured ʻōhiʻa (*Metrosideros polymorgha*), *uluhe* in open areas, *hala*, and several native shrubs: *naupaka kuahiwi* (*Scaevola gaudichaudiana*), *ʻākia* (*Wikstroemia oahuensis*), *pūkiawe* (*Styphelia tamaeiameia*), and non-native Christmas berry (*Schinus terebinthfolius*) are typically present in the elevation range of the four AOC.

Table 1. Symbol legend for Figure 4.

Vegetation (or mapping unit):

* -- Badlands; mass wasting scars.
AFo – Polynesian Forest grove.
f -- *Uluhe* (fern field).
Gr -- Broomsedge (*Andropogon virginicus*) grassland
OSc -- *ʻŌhiʻa* Scrub.
RFo -- Riparian Forest.
UFo – Upland Forest.

The Koa/Uluhe Woodland of Whistler (2003) proved difficult to map. Native trees, such as *koa*, *hala*, and *olopua* (*Nestegis sandwicensis*) are associated with a woodland or open forest, but this "vegetation" type merges imperceptibly with the *Ōhiʻa* Scrub and the two are not all that distinct on the scale of the vegetation map. The scattered native trees associate more closely with the Upland Forest, generally above the elevation of the AOC; the *Ōhiʻa* Scrub tends to associate with open areas along the lateral ridges, merging with mapped areas of monotypic *uluhe* fern and mass wasting sites (see below) at and above the elevations of the AOC.

Another plant association (Aboriginal Lowland Wet Forest; AFo) was noted during the present survey, and is interesting because it appears to be a remnant from the period of aboriginal occupation of the valley not later disturbed by non-indigenous farming or forestry. At the upper ends of these small side gulches, just below the point where the gulch floor becomes very steep (and where the side walls are steep), an association of mostly aboriginal introductions (plants introduced by early Polynesian migrations to Hawaiʻi) indicates a remnant flora planted and maintained by the valley's original inhabitants on land that was accessible but generally too steep (or the gulch too narrow) to cultivate. This association includes *hala*, ʻ*ōhiʻa ʻai* (mountain apple or *Syzygium malaccense*), *kukui* (*Aleurites moluccana*), and *ki* (ti or *Cordyline fruticosa*), all locally abundant. Because of shadowing in the steep gulches, this vegetation type could not be mapped.

Two, small, but very distinct areas are also mapped: *uluhe* (fern; *Dicranopteris linearis*; f) and Badland (∗). *Uluhe* forms monotypic or nearly monotypic patches on moderately steep hill slopes. The size and density of this scrambling fern limit invasions by other species, and fern-covered areas give way to more diverse vegetation only slowly and typically around edges where taller plants gradually shade out the fern. Badlands here represent sites of mass wasting (soil avalanches) and subsequent continued soil erosion. Mass wasting is the most prevalent erosion process in Hawaiʻi (Macdonald, Abbott, and Peterson, 1983). Continued erosion of mass wasting sites in wet Waikāne Valley occurs because the exposed scar has very poor soil. The typical pioneer species on these badlands is *uluhe*.

Several small areas of broomsedge (*Andropogon virginicus*) grassland (Gr) occur on the southeast end of the parcel. This grassland type prefers exposed ridges and slopes; it is more prevalent on the more hilly slopes across the valley (south) from the MCBH parcel. The extreme upland area (north part of the MCBH parcel) is included in the mapping as part of the *ʻŌhiʻa* Scrub (OSc). However the vegetation (minimally explored in this survey other than by binoculars ar a distance) may be very different from the *ʻŌhiʻa* Scrub areas actually surveyed at lower elevations. The satellite image suggests *kukui* (*Aleurites moluccana*) is plentiful in the narrow gorge areas[6], and the composition of the flora on the steep ridges is anticipated to be more diverse with respect to native trees and shrubs. Areas in these upper slopes mapped as Upland Forest, on the other hand, seem to be dominated by non-native trees, including albizia.

Flora

Whistler provided lengthy descriptions of the flora within each of the four plant associations and that report should be consulted for additional details. The list of species provided here as Table 2 covers only those species recorded during the 2010 surveys. A comparison between the flora observed by Whistler within the Waikane Valley Impact Area and by Guinther in the valley outside the Impact Area is presented in Guinther et al. (2005). Text descriptions herein

[6] *Kukui* trees have a distinct whitish-green crown, very noticeable in Fig. 4 on the unshaded side of the ridge (Hakipuʻu Valley).

Table 2. Listing of plants recorded in 2010 survey.

Species	Common Names	Status	Notes
FERNS and FERN ALLIES			
BLECHNACEAE (Blechnum Family)			
Blechnum occidentale L.	blechnum	X	R
DICKSONIACEAE (Tree Fern Family)			
Cibotium chamissoi Kaulf.	*hāpuʻu*	**End**	U
GLEICHENIACEAE (Gleichenia Family)			
Dicranopteris linearis (Burm.) Underw.	*uluhe*	**Ind**	AA
LINDSAEACEAE (Lace Fern Family)			
Sphenomeris chinensis (L.) Maxon	*palaʻa*	**Ind**	A
LYCOPODIACEAE (Club Moss Family)			
Lycopodiella cernua (L.) Pic. Serm.	*wāwaeʻiole*	**Ind**	R
MARATTIACEAE			
Angiopteris evecta (G. Forst.) Hoffm.	mule's-foot fern	X	R
NEPHROLEPIDACEAE (Sword Fern Family)			
Nephrolepis exaltata hawaiiensis Wagner	*niʻaniʻau*	**End**	O
Nephrolepis multiflora (Roxb.) Jarret ex Morton	hairy swordfern	X	A
POLYPODIACEAE (Common Fern Family)			
Lepisoris thunbergianus (Kaulf.) Ching	*pākahakaha*	**Ind**	R
Phlebodium aureum (L.) J. Sm.	*lauaʻe haole*	X	O
Phymatosorus grossus (Langsd. & Fisch.) Brownlie	*lauaʻe*	X	U
PSILOTACEAE (Psilotum Family)			
Psilotum nudum L.	*moa*	**Ind**	R
PTERIDACEAE			
Pityrogramma austroamericana Domin	gold fern	X	C
Pteris cretica L.	cretan brake	**Ind**	U
THELYPTERIDACEAE (Downy Woodfern Family)			
Christella parasitica (L.) Leville	oak fern	X	C
Christella dentata (Forssk.) Brownsey & Jermy	oak fern	X	O

Table 2 (continued).

Species	Common Names	Status	Notes
DICOTYLEDONS			
ACANTHACEAE (Acanthus Family)			
Thunbergia fragrans Roxb.	white thunbergia	X	U
ANACARDIACEAE (Mango Family)			
Mangifera indica L.	mango	X	O
Schinus terebinthefolius Raddi	Christmas berry	X	R
APIACEAE			
Centella asiatica (L.) Urb.	Asiatic pennywort	X	R
ARALIACEAE			
Schefflera actinophylla (Endl.) Harms	octopus tree	X	A
ASTERACEAE (Sunflower Family)			
Ageratina riparia (Regel) R. King & H. Robinson	Maui *pāmakani*	X	R
Bidens alba (L.) DC.	beggar's-tick	X	R
Bidens cf. *cervicata* Sherff	*koʻokoʻolau*	**End**	R
Emilia fosbergii Nicolson	*pualele*	X	R
BALSAMINACEAE			
Impatiens walleriana J. D. Hook.	impatiens, busy lizzy	X	R<1>
BIGNONIACEAE (Bignonia Family)			
Spathodea campanulata P. Beauv.	African tulip tree	X	U
EBENACEAE			
Diospyros sandwicensis (A. DC) Fosb.	*lama*	**End**	R<2>
EPACRIDACEAE (Epacris Family)			
Styphelia tameiameiae (Cham. & Schlechtend.) F. v. Mueller	*pūkiawe*	**Ind**	R
EUPHORBIACEAE (Spurge Family)			
Aleurites moluccana (L.) Willd.	candlenut, kukui	Pol	U
Macaranga mappa (L.) Muell. Arg.	bingabing	X	U
FABACEAE (Pea Family)			
Acacia koa A. Gray	*koa*	**End**	U
Chamaecrista nictitans (L.) Moench	partridge pea, *lauki*	X	O
Crotalaria pallida Aiton	smooth rattlepod	X	R
Falcataria moluccana (Miq.) Barneby & Grimes	albizia	X	A

Table 2 (continued).

Species	Common Names	Status	Notes
GOODENIACEAE (Goodenia Family)			
Scaevola gaudichaudiana Cham.	*naupaka kuahiwi*	**End**	U
MALVACEAE (Mallow Family)			
Hibiscus tiliaceus L.	*hau*	**Ind**	A
MELASTOMATACEAE (Melastoma Family)			
Clidemia hirta (L.) D. Don	Koster's curse	X	C
MORACEAE (Mulberry Family)			
Ficus microcarpa L. f.	Chinese banyan	X	R
MYRSINACEAE (Myrsine Family)			
Ardisia crenata Sims	Hilo holly	X	O
Ardisia elliptica Thunb.	shoebutton ardisia	X	AA
MYRTACEAE (Myrtle Family)			
Metrosideros polymorpha Gaud.	*ʻōhiʻa lehua*	**End**	AA
Psidium cattleianum Sabine	strawberry guava	X	AA
Psidium guajava L.	common guava	X	U
Syzygium cumini (L.) Skeels	Java plum	X	C
Syzygium malaccense (L.) Merr. & Perry	mountain apple, *ʻohiʻa ʻai*	Pol	O
OLEACEAE			
Nestegis sandwicensis (A. Gray) Degener, Degener, & Johnson	*olopua*	**End**	R
OXALIDACEAE (Wood-Sorrel Family)			
Oxalis corniculata L.	wood sorrel	Pol	R
PASSIFLORACEAE (Passionflower Family)			
Passiflora laurifolia L.	yellow granadilla	X	O
PITTOSPORACEAE			
Pittosporum sp.	*hoʻawa*	**End**	R
PROTACEAE (Protea Family)			
Grevillea robusta A. Cunn. ex R. Br.	silk oak	X	R
ROSACEAE (Rose Family)			
Osteomeles anthyllidifolia (Sm.) Lindl.	*ʻulei*	**Ind**	U
Rubus rosifolius Sm.	thimbleberry	X	R

Table 2 (continued).

Species	Common Names	Status	Notes
RUBIACEAE (Coffee Family)			
Canthium odoratum (G. Forster) Seem.	*alahe'e*	**Ind**	R
Morinda citrifolia L.	Indian mulberry, *noni*	Pol	U
Paederia scandens (Lour.) Merr.	*maile pilau*	X	O
RUTACEAE			
Citrus maxima (J. Burm.) Merr.	pummelo	O	R<1>
THYMELAEACEAE (Akia Family)			
Wikstroemia oahuensis (A. Gray) Rock	*'akia*	**End**	O
TILIACEAE (Linden Family)			
Heliocarpus popayanensis Kunth	moho	X	C
VERBENACEAE (Verbena Family)			
Citharexylum caudatum L.	fiddlewood	X	O
Lantana camara L.	lantana	X	R
Stachytarpheta urticifolia (Salisb.) Sims	blue rat's-tail	X	O
MONOCOTYLEDONS			
AGAVACEAE (Agave Family)			
Cordyline fruticosa (L.) A. Chev.	ti, *ki*	Pol	U
Pleomele halapepe St. John	*hala pepe*	**End**	R
ARACEAE (Arum Family)			
Alocasia macrorrhiza (L.) Schott	*'ape*	Pol	O
Dieffenbachia maculata (Lodd.) D. Don	spotted dumb-cane	X	R
Epipremnum pinnatum (L.) Engl.	pothos	X	O
ARECACEAE (Palm Family)			
Ptychosperma macarthurii (Vietch) J.D. Hooker	MacArthur palm	X	U
CYPERACEAE (Sedge Family)			
Carex wahuensis wahuensis C.A. Mey.	---	**End**	O
Cyperus involucratus Rottb.	umbrella sedge	X	R
Cyperus polystachyos Rottb.	---	**Ind**	R
Fimbristylis dichotoma (L.) Vahl.	forked fimbry	**Ind**	R
DIOSCOREACEAE (Yam Family)			
Dioscorea bulbifera L.	bitter yam, hoi	Pol	R

Table 2 (continued).

Species	Common Names	Status	Notes
HELICONIACEAE (Heliconia Family)			
Heliconia bihai (L.) L.	lobster claw	O	O<1>
Heliconia caribaea Lam.	heliconia	O	O<1>
Heliconia psittacorum L. f.	parakeet flower	O	U<1>
MUSACEAE (Banana Family)			
Musa hybrid	banana	Pol	U
Musa velutina H. Wendl. & Drude	pink banana	O	R<1>
ORCHIDACEAE (Orchid Family)			
Spathoglottis plicata Bl.	Philippine ground orchid	X	U
PANDANACEAE (Screwpine Family)			
Pandanus tectorius Parkinson	screwpine, *hala*	**Ind**	AA
POACEAE (Grass Family)			
Andropogon virginicus L.	broomsedge	X	C
Axonopus fisifolius (Raddi) Kuhlmann	nrw-lvd. carpetgrass	X	U
Coix lachryma-jobi L.	Job's tears	X	U
Melinus minutiflora P. Beauv.	molasses grass	X	U
Oplismenus hirtellus (L.) P. Beauv.	basket grass	X	O
Paspalum conjugatum Bergius	Hilo grass	X	U
Paspalum scrobiculatum L.	rice grass	**Ind**	R
Pennisetum polystachion (L.) Schult.	feathery pennisetum	X	U
Sacciolepis indica (L.) Chase	Glenwood grass	X	C
Urochloa maxima (Jacq.) Webster	Guinea grass	X	O
Urochloa mutica (Forssk.) Nguyen	California grass	X	U<1>
ZINGIBERACEAE (Ginger Family)			
Alpinia purpurata (Viell.) K. Schum.	red ginger	X	O<1>
Costus woodsonii Maas	red spiral ginger	O	O<1>
Hedychium cornorarium Koenig	white ginger	X	O<1>
Zingiber zerumbet (L.) Smith	shampoo ginger, *'awapuhi*	Pol	O

Legend for Table 2:

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name, if known.
3. Biogeographic status. The following symbols are used:

Table 2 (continued).

End = endemic (found only in Hawaiʻi).
Ind = indigenous (native to Hawai`i as well as other geographic areas).
Orn = ornamental; result of planting(s); alien probably not naturalized.
Pol = Polynesian introduction (introduced to Hawaiʻi by Polynesians before the arrival of Europeans).
X = Introduced or alien (not native, introduced to Hawai`i, either accidentally or intentionally, after the advent of the Europeans).

4. "Notes" = general abundance in the central project area (access road to ~500 ft elevation) using the following:
AA = very abundant; dominant in some areas.
A = abundant; dominant or co-dominant in some areas.
C = common; regularly encountered and locally abundant.
O = occasional; encountered infrequently and/or locally numerous.
U = uncommon; encountered very infrequently.
R = rare; only a few individuals at most encountered in survey.
<1> = Distribution here mostly limited to riparian areas (and formerly farmed areas) close to Waikāne Stream.
<2> = Specimen(s) observed lacking flowers or fruit; identification uncertain.

---

focus on native plants present in the project area. Observed plant species, as presented in Table 2, are divided into three groupings: ferns (including fern allies) and two flowering plant taxa: the monocots and the dicots. Within these groups, species are presented grouped by family, with each family and each species within a family listed in alphabetical order.

All of the native species—including the eleven identified endemic plants recorded in the present survey (and two from earlier surveys in the valley as reported in Guinther et al, 2003, 2005 and not recorded in 2010): *Adenophorus tamariscinus, Nephrolepis exaltata hawaiiensis, Cibotium chamissoi*, *Metrosideros polymorpha*, *Acacia koa*, *Scaevola gaudichaudiana, Diospyros sandwicensis*, *Pipturus albidus*, *Wikstroemia oahuensis*, *Nestegis sandwicensis*, *Pittosporum* sp., *Pleomele halapepe*, and *Carex wahuensis*—are widespread species that are not included on the U.S. Fish and Wildlife list of threatened or endangered plant species for Hawaiʻi (USFWS, 2010). A species of *Bidens* that was observed in several places along high lateral ridgelines would likely be an endemic, but it could not be identified despite encountering and collecting several specimens with flowers and seeds. This plant appeared closest in form to the native, *B. cervicata*, but may be a cross between this species and one of the non-native beggar-ticks such as *B. alba*. The latter was observed in open areas at the far eastern end of the MCBH parcel.

Native species tend to be rare along Waikāne Stream and the flood plain and former agriculture areas beside the stream, exceptions being indigenous *hau* (*Hibiscus tiliaceus*), especially dense where small side streams join the main stream, and *hala*, which borders the flood plain. The diversity and abundance of native plants increases with elevation within the Waikane Valley Impact Area. The most ubiquitous native tree is *hala* (*Pandanus tectorius*), found throughout the site, and most abundant on the side slopes of the small gulches that cross the site, laterals to Waikāne Stream. This plant is unusually abundant in Waikāne Valley.

At middle elevations, on the lateral interfluves in the area of the AOCs, *ʻōhiʻa* (*Metrodsideros polymorpha*), *naupaka kuahiwi* (*Scaevola gaudichaudiana*), *ʻākia* (*Wikstroemia oahuensis*), and *pūkiawe* (*Styphelia tamaeiameia*) are typically present, and *uluhe* fern (*Dicranopteris linearis*) is very abundant in patches. Native tree fern (*Cibotium chamissoi*) is uncommon, growing along the slopes of the side gulches. Throughout this middle area, in patches or more dispersed, occurs *palaʻa* fern (*Sphenomeris chinensis*), and less commonly, *niʻaniʻau* fern (*Nephrolepis exaltata hawaiiensis*), although a non-native sword fern (*N. multiflora*) is far more common in the lower valley. Further up, typically at or above the upper ends of the AOCs, *koa* (*Acacia koa*) is found, along with *Carex wahuensis*, *olopua* (*Nestegis sandwicensis*), *ulei* (*Osteomeles anthyllidifolia*), *alaheʻe* (*Psychotra odorata*), *hala pepe* (*Pleomele halapepe*), and *hoawa* (*Pittosporum* sp.).

The density and diversity of native plants differed substantially between the four AOCs. AOC 1, on a narrow interfluve or ridgeline located furthest into the valley, and at a generally higher elevation (between 400 and 440 ft or 120-135 m ASL) than the other AOCs, supported the most native vegetation. AOC 3 also supported native vegetation, although largely in the upper half and mostly *ʻōhiʻa* and *uluhe*. AOC 2 and AOC 4 supported only a limited diversity of native plants, mostly patches of *uluhe* and *hala,* species common throughout the elevation range between 200 and 400 ft (60–120 m) in this part of Waikāne Valley. In general, concentrations of native plants other than *uluhe*, *palaʻa*, *hala, ʻōhiʻa*, and koa, occurred along the narrow ridgelines at elevations above 500 ft (150 m).

Figure 5 shows the locations of selected trees and other natives whose positions were recorded with the GPS unit because they were found within or close to the AOCs and their preservation would be of concern. During the survey, locations with native trees were purposely visited. However, the feature points are

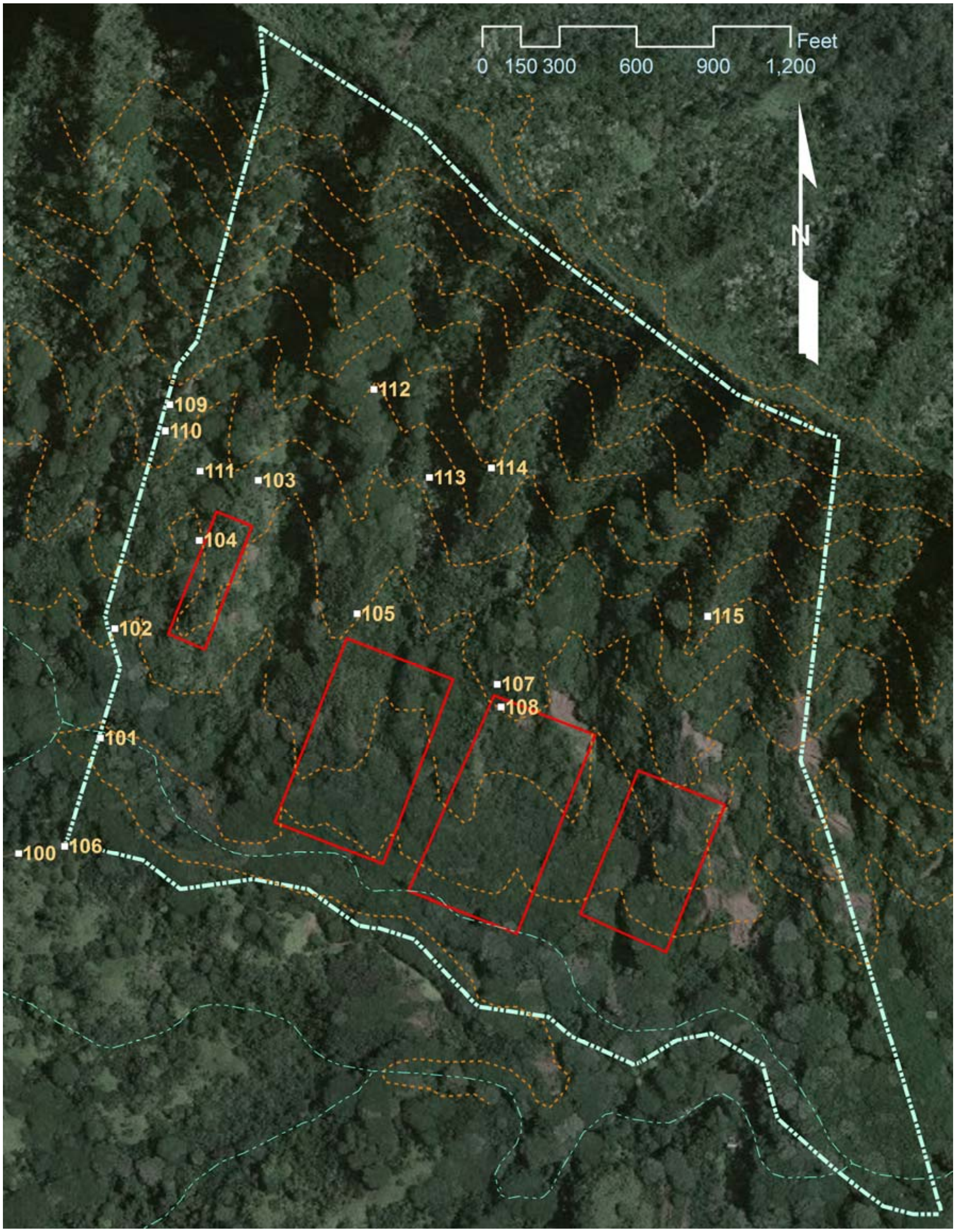


Figure 5. GPS recorded features projected on satellite image with stream and elevation contours (100-ft interval) added. AOCs outlined in red.
See Table 3 for key.

certainly not inclusive of all native trees of interest within the Waikane Valley Impact Area, Rather, the points represent specimens encountered on the survey routes depicted in Fig. 3 and demonstrate a pattern of distribution as expressed above that native flora is found upslope of the 500 ft (150 m) contour. Table 3 is a key to the numbered feature points.

Table 3. Key to features recorded with GPS unit shown in Fig. 5.

No.	Date	Latitude N	Longitude W	Feature	Notes:
100	2/25/10	21° 30' 1.50"	157° 52' 32.60"	upper gate	on access road
101	2/25/10	21° 30' 5.97"	157° 52' 29.17"	Waikāne Stream	at fence crossing
102	2/25/10	21° 30' 10.39"	157° 52' 28.562"	fence jog	
103	2/25/10	21° 30' 15.95"	157° 52' 22.65"	*olopua*	photographed
104	2/25/10	21° 30' 13.65"	157° 52' 25.09"	gulch edge	AOC 1
105	2/25/10	21° 30' 10.74"	157° 52' 18.58"	*koa*	above AOC 2
106	2/25/10	21° 30' 1.82"	157° 52' 30.65"	fence corner	
107	3/5/10	21° 30' 8.06"	157° 52' 12.80"	*koa*	above AOC 3
108	3/5/10	21° 30' 7.16"	157° 52' 12.65"	*koa*	in AOC 3
109	3/31/10	21° 30' 18.89"	157° 52' 26.40"	end of fence	
110	3/31/10	21° 30' 17.85"	157° 52' 26,47"	fence jog	
111	3/31/10	21° 30' 16.32"	157° 52' 25.04"	*olopua*	
112	3/31/10	21° 30' 19.46"	157° 52' 17.87"	Polynesian plants	*kukui, ʻōhiaʻai, ki, hala;* *hala pepe* above
113	3/31/10	21° 30' 16.06"	157° 52' 15.57"	Polynesian plants	*kukui, ʻōhiaʻai, ki, hala;*
114	3/31/10	21° 30' 16.48"	157° 52' 13.02"	*Bidens* sp.	ridgeline
115	4/8/10	21° 30' 10.67"	157° 52' 4.10"	*lama*	many natives here

Invertebrate Surveys

Although host plants frequented by native insects were encountered on each survey traverse, the only native invertebrate noted during the entire daylight survey were *ʻōhiʻa* gall insects (Family Psyllidae), which are very common throughout the Islands. These were observed only on the March 5, 2010 survey. No threatened or endangered invertebrates were seen during the survey.

As anticipated, native and adventive (non-native) invertebrates responded to the nighttime survey with an attractant light source. Native invertebrate noted during the night survey are listed in Table 4. Again, no threatened or endangered invertebrates were seen during this portion of the survey.

Table 4. List of invertebrates from the Waikane Valley Training Area[7], Oʻahu, May 12-13, 2010.

PHYLUM ARTHROPODA			
CLASS INSECTA			**INSECTS**
ORDER COLLEMBOLA			**springtails**
		Entomobryidae	
	Adv	*Tomocerus minor* (Lubbock, 1862) [common, leaf litter, on trunks]	
ORDER ORTHOPTERA			**grasshoppers, katydids, crickets**
		Gryllidae	
U	End	*Laupala* sp. [audio record only, all species are endemic]	
		Mantidae (preying mantid)	
	Adv	*Tenodera angustipennis*	
ORDER PSOCOPTERA			**bark louse**
		Psocidae	
U	End	*Ptycta pupukea* Thornton [species uncertain]	
ORDER HETEROPTERA			**true bugs**
		Miridae (plant bugs)	
R	End?	*Hyalopeplus pellucidus* (Stal)	
R	End	*Nesiomiris* sp. [at light; hosted on *Schefflera*)	
ORDER HOMOPTERA			**leafhoppers, planthoppers**
		Psyllidae	
	Adv	*Acizzia uncatoides* (Ferris & Klyver)	
A	End	*Trioza iolani* on ohi'a [only as nymphs, many]	
ORDER COLEOPTERA			**beetles**
		Cerambycidae	
	Adv	*Ceresium unicolor*	
ORDER LEPIDOPTERA			**butterflies, moths**
		Cosmopterygidae (casebearer micro-moths)	
C	End	*Hyposmocoma* species 1 (nocturnal, at MV light)	
U	End	*Hyposmocoma* species 2	

[7] The light was set up outside the Waikane Valley Impact Area (see Fig. 3) at a site favorable to attract insects from the MCBH paecel, although insects arriving would not be exclusively from this part of Waikāne Valley.

Table 4 (continued)

ORDER LEPIDOPTERA (cont.)		**butterflies, moths**
		Cosmopterygidae (cont.)
U	End	*Hyposmocoma* species 3
R	End	*Hyposmocoma* species 4
		Crambidae (micro-moths)
C	End	*Eudonia* species 1 (black & white; at light)
C	End	*Eudonia* species 2 (at light)
U	End	*Eudonia* species 3 (at light)
R	End	*Eudonia* species 4 (at light)
A	End	*Mestolobes* sp. 1 (brown)
U	End	*Mestolobes* sp. 2 (white banded)
		Geometridae (geometer moths and inchworms)
R	End	*Scotorythra nephelosticta cocytias* Meyrick, 1904
		Noctuidae (underwings, cutworms, and relatives)
	Adv	*Ascalapha odorata* (Linn.) (black witch)
ORDER DIPTERA		**flies**
		Drosophilidae (pomace flies)
	Adv	*Drosophila suzukii*
ORDER NEUROPTERA		**nerve-winged insects**
		Hemerobiidae
	Adv	*Sympherobius barberi* Banks (brown lacewing)
ORDER HYMENOPTERA		**wasps, bees, ants**
		Formicidae
	Adv	*Anoplolepis gracilipes* (F. Smith)
	Adv	*Pheidole megacephala* (big-headed ant)
	Adv	*Camponotus* sp. (carpenter ant)

Table 4. Legend

Status:

End	endemic to Hawaiian Islands
Ind	indigenous to Hawaiian Islands
Adv	adventive
Pur	purposefully introduced
?	unknown

Abundance = occurrence ratings:

R	Rare: seen in only one or perhaps two locations
U	Uncommon: seen at most in several locations
O	Occasional: seen with some regularity
C	Common: observed numerous times during survey
A	Abundant: found in large numbers
AA	Very abundant: abundant and dominant

Avian Resources

A total of 369 individual birds, representing 15 species, from 11 separate families were recorded during station counts in 2003. An average of 41 birds were recorded per station-count. No birds were recorded in 2010 due to adverse weather conditions, but all the species recorded in 2003 are expected to still be present. All of the birds recorded in 2003 are alien species. No avian species currently listed by either the U.S. Fish and Wildlife Service under the Endangered Species Act of 1973, as amended, or by the State of Hawaiʻi under its endangered species program were detected within the study area (DLNR, 1998; U. S. Fish & Wildlife Service (USFWS) 1999a,b, 2001, 2002, 2005, 2010). Avian diversity was relatively low. Japanese White-Eyes (*Zosterops japonicus*) accounted for 33% of the total number of birds recorded during station counts.

The findings of the avian survey in 2003 were consistent with the habitat present within the study area, and the elevation range over which the Waikāne Valley Impact Area is located. The fact that no native avian species were detected is not surprising given the alien dominated vegetation found in the study area. Although not detected during the 2003 survey or during visits to the site in 2010, it is feasible that the endemic Oʻahu sub-species of the ʻElepaio (*Chasiempis sandwichensis ibidis*)[8] may occasionally use resources within the project vicinity. The western boundary fence of the former training area is the eastern boundary of Unit 3 of the federally delineated Critical Habitat for this species (USFWS, 2001; Fig. 6).

Although also not detected it is likely that the endemic sub-species of the Short-eared Owl (*Asio flammeus sandwichensis*), occasionally uses resources present within the site, especially in the more open *uluhe* (*Dicranopteris linearis*) dominated higher elevations of the valley wall. The Oʻahu population of this endemic Hawaiian sub-species of the near cosmopolitan species is listed as endangered by the state of Hawaiʻi, but it is not listed under federal statutes (DLNR, 1998; USFWS, 2010).

Mammalian Resources

Four mammalian species were detected during visits to the site. Sign and scat of domestic dog (*Canis f. familiaris*), small Indian mongoose (*Herpestes a.*

[8] The American Ornithological Union has announced that they have accepted a petition to split this species into three separate species, Kauaʻi ʻElepaio (*Chasiempis sclateri*), Oʻahu ʻElepaio (*Chasiempis ibidis*), and Hawaiʻi ʻElepaio (*Chasiempis sandwichensis*). This change in taxonomy is expected to be published in the 51st Supplement to the Check-list of North American Birds in July 2010.

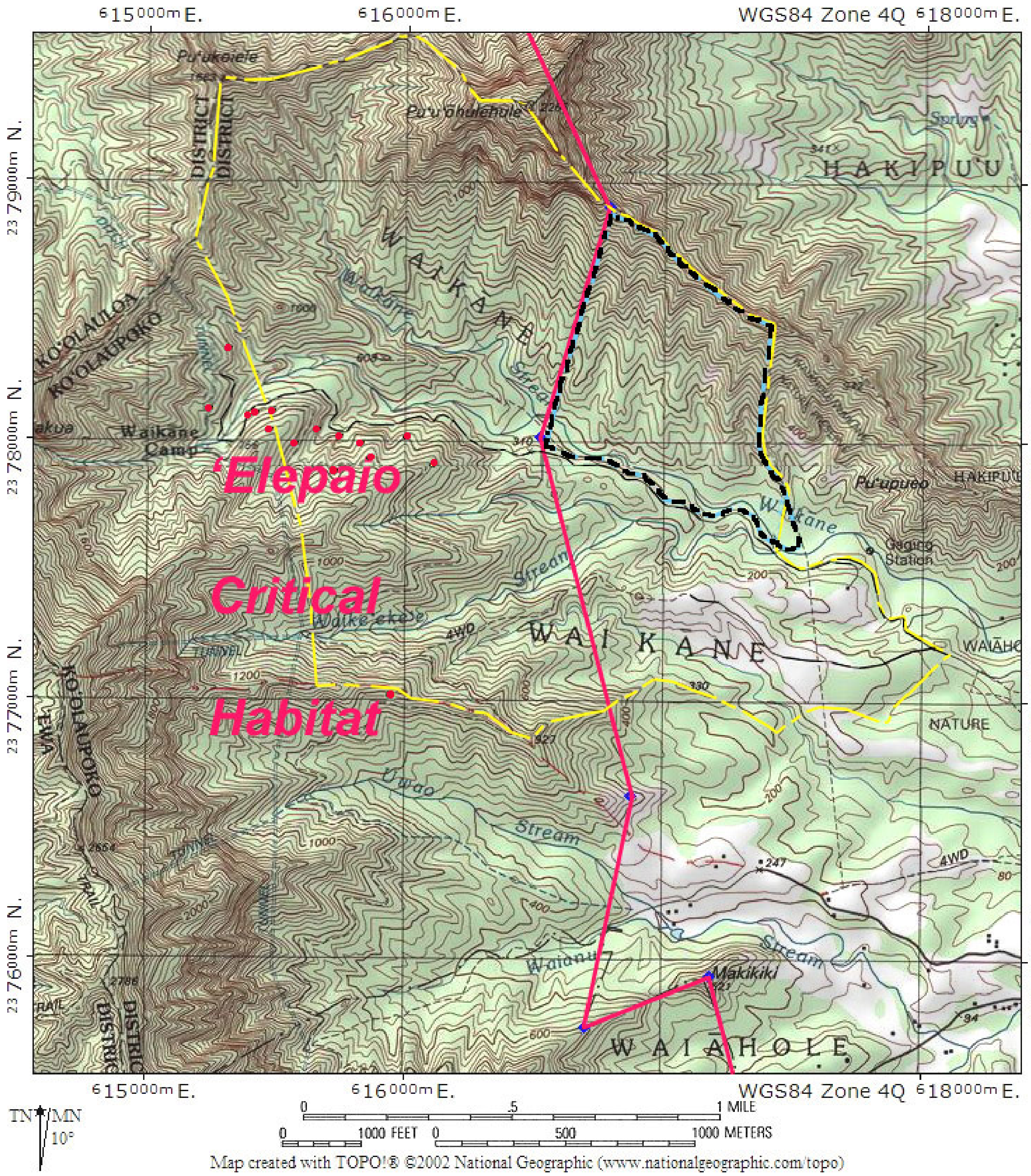


Figure 6. Map showing designated Critical Habitat for the Oʻahu ʻElepaio (Unit 3, central Koʻolau Mountains; from USFWS, 2001; boundary in red), the Waikane Training Area (approx. area boundary in yellow), and the Waikane Valley Impact Area (present survey boundary, shown black dashes). Red dots represent recent sightings of *ʻElepaio* (after VanderWerf, 2005).

auropunctatus), cat (*Felis catus*), and pig (*Sus s. scrofa*) were encountered throughout the area surveyed. Pigs were spotted. No bats were detected during any of the visits to the site, a finding that is not surprising as there are no historical records of the Hawaiian hoary bat having been recorded from the project area (USFWS, 1998, Tomich, 1986, MCBH, 2006, David, 2010). The four mammalian species detected within the study site are alien, human commensal species, and are generally considered to threaten native species and the habitats on which native species they depend for their continued survival.

‘Elepaio Critical Habitat

The USFWS has designated Critical Habitat on O‘ahu for only one of the eight federally listed species currently known from the island of O‘ahu. In 2001 the USFWS published a final rule designating 65,897 acres (26,261 hectares) of land, in five units as Critical Habitat for the O‘ahu sub-species of the ‘Elepaio (USFWS, 2001). As the proposed action area is outside of Unit 3 of the federally designated Critical Habitat for ‘Elepaio (Fig. 6, above) it is not expected that the proposed action will result in impacts to any designated Critical Habitat. There is no equivalent statute under state law.

Replanting Recommendations

Absent the opportunity to assess the degree of vegetation removal following UXO exploratory activities in 2010, only very general recommendations can be made with regard to replanting these areas. Presumably, vegetation removal involved only some areas of particularly dense ground cover by ferns and/or herbaceous plants, or thickets of strawberry guava or *hau*[9]. Discussions with the USA Environmental onsite managers indicated that no trees were being disturbed. Other than access trails through the riparian forest, all of the clearing occurred within the AOC. As described on page 20 above, the AOC are dominated by non-native plants, with the exception of AOC 1.

The dominant plant successional process underway in the Valley is the replacement of elements of the native vegetation with aggressive, non-native plants, particularly large trees such as albizia. This process is complete along the valley floor and nearly complete at the elevation range of the AOC. Native plants that appear most successful in resisting this transformation are *hala* and *hau*. Removal of any of the non-native trees or shrubs is desirable, but in practical terms, will have no impact on the succession underway unless incorporated into a long-term program of weedy growth removal. Attempts to

[9] *Hau*, although considered likely to be an indigenous species (or Polynesian introduction; Wagner, Herbst, and Sohmer, 1990), occupies a somewhat unusual position, in that it 1) grows more as a large shrub rather than an upright tree and is considered invasive of wet and riparian areas. It can be destructive of ancient pond field (*lo‘i*) sites.

alter the nature of the lowlands by replanting native trees will amount to nothing in the long-term; replacement of individual elements (trees, large shrubs) within a forest setting is best left to nature, since the seed bank present in the soil will select the fittest replacements. To do otherwise is to invite failure.

Manual removal of dense fern growth (such as *uluhe*) typically is an incomplete process and the plant will recover from the rhizomes remaining just below the soil surface. Opening the dense cover may provide an opportunity for a few seedlings of shrubs or trees to gain a foothold in the fern patch, outgrowing the recovering fern fronds. While this outcome of human intervention or "clearing" is a possibility, further intervention seems unwarranted. Areas of *uluhe* here tend to be where at least a few native shrubs are most common, and these species will more likely benefit from reduction of *uluhe*. Further, *uluhe* is a pioneer species, and *uluhe* patches are naturally replaced as shrubs and trees invade and shade out the fern.

If, as a result of the present munitions clean-up operation, or future clean-up operations, interfluvial areas are substantially cleared and there is a desire to follow-up with appropriate plantings to reduce erosion and promote native plants, the best candidates are those natives that can be propagated in large numbers in a nursery, and then out-planted in mass. Recommended would be *ʻaʻaliʻi*, (*Dodonaea viscosa*), *ʻakia*, *ʻōhiʻa*, *Carex wahuensis*, and perhaps *koa* and *alaheʻe* in lesser numbers. These species can be produced in large numbers from seed in a nursery and would survive out-planting if undertaken early in the wet season, since remoteness of the area precludes watering.

References Cited

AECOS Inc. 1995. A Natural Resources Inventory of Coastal Parcels at Waiahole and Waikane on Windward O'ahu. Prep. for Gerald Park Urban Planners, Honolulu. AECOS No. 824A: 68 pp.

American Ornithologist's Union. 1998. *Check-list of North American Birds*. 7th edition. American Ornithologist's Union. Washington D.C. 829pp.

_______. 2000. Forty-second supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 117:847-858

_______. 2002. Forty-third supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 119: 897-906.

Banks, R. C., C. Cicero, J. L. Dunn, A. W. Kratter, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2002. Forty-third supplement to the American Ornithologist's Union *Check-list of North American Birds*. *Auk*, 119: 897-906.

_____ , ______, ______, ______, ______, ______, ______, and ______. 2003 Forty-fourth supplement to the American Ornithologist's Union *Check-list of North American Birds*. *Auk*, 120: 923-931.

_____ , ______, ______, ______, ______, ______, ______, and ______. 2004 Forty-fifth supplement to the American Ornithologist's Union *Check-list of North American Birds*. *Auk*, 121: 985-995.

_____ , ______, ______, ______, ______, ______, ______, and ______. 2005 Forty-sixth supplement to the American Ornithologist's Union *Check-list of North American Birds*. *Auk*, 122: 1031-1031.

_____ , ______, ______, ______, ______, ______, ______, and ______. 2006 Forty-seventh supplement to the American Ornithologist's Union *Check-list of North American Birds*. *Auk*, 123: 926-936.

______, C. R. Terry Chesser, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2007 Forty-eighth supplement to the American Ornithologist Union *Check-list of North American Birds*. *Auk*, 124: 1109-1115.

Banks, R. C., C. R. Terry Chesser, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, and D. F. Stotz. and K. Winker. 2008 Forty-ninth supplement to the American Ornithologist Union *Check-list of North American Birds*. *Auk*, 125: 758-768.

Chesser, R. T., R. C. Banks, F. K. Barker, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, and D. F. Stotz, and K. Winker. 2009. Fiftieth supplement to the American Ornithologist Union Check-list of North American Birds. *Auk*, 126: 1-10.

Char, W. P. 1990. Botanical survey, Waikane Golf Course, Waikane Valley, Ko'olaupoko District, O'ahu. 17 pp.

David R. E. 2010. Unpublished Field Notes - Island of O‘ahu 1980-2010.

Department of Land and Natural Resources (DLNR). 1998. Indigenous Wildlife, Endangered and Threatened Wildlife And Plants, and Introduced Wild Birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule §13-134-1 through §13-134-10, dated March 02, 1998.

Drigot, D. C., B. A. Wilcox, and K. N. Duin. 2001. MCBH Integrated Natural Resources Management Plan/Environmental Assessment (INRMP/EA) (2002-2006). Prep. by MCBH Environmental Department and Sustainable Resources Group International Inc.

Englund, R. A., and K. T. Arakaki. 2003. Report on long-term aquatic insect monitoring in 2002 by Hawaii Biological Survey, Bishop Museum in Pelekunu Valley, Moloka`i, Hawai`i. Prep. for TNCH Moloka`i Office, P.O. Box 220 Kualapu`u, Hawai`i. Contribution No. 2000-010 to the Hawaii Biological Survey: 10 pp.

_______, and L. S. Godwin. 2002. Non-insect aquatic invertebrate surveys of four windward O`ahu streams impacted by the Waiahole Ditch. Prep. for Dept. Land and Natural Resources, Hawaii Division of Aquatic Resources. Hawaii Biological Survey Cont. No. 2002-020: 9 pp.

_______, C. Imada, D. J. Preston, and K. Arakaki. 2003a. Final report. Kaneo`he Bay, O`ahu stream estuary studies. Prep. for the Dept. Land and Natural Resources, Hawaii Division on Aquatic Resources. Hawaii Biological Survey Cont. No. 2003-013, Bishop Museum. 42 pp.

Englund, R. A., D. J. Preston, K. Arakaki, and M. K. K. McShane. 2003b. Aquatic insect surveys of four windward O`ahu streams impacted by the Waiahole Ditch. Prep. for the Dept. Land and Natural Resources, Hawaii Division on Aquatic Resources. Hawaii Biological Survey Cont. No. 2003-016, Bishop Museum. 8 pp.

Guinther, E. B., A. Whistler, R. David, S. Montgomery, and S. Burr. 2003. Biological resources report for a proposed Marine Corps Jungle Warfare Training Area in Waikāne Valley on windward Oʻahu. AECOS Consultants, AC039: 40 pp.

_______, R. David, and S. J. Montgomery. 2005. Biological assessment support for _OE/UXO efforts at the Waikane Training Area, Kahalu'u, Windward O'ahu. Prep. for Donaldson Enterprises Inc. AC050: 31 pp.

Hawai'i Biological Survey. 2002 update. *Terrestrial Arthropod Checklist, online authority file of terrestrial arthropod names for the Hawaiian Islands.* B. P. Bishop Museum, Honolulu, Hawai'i. URL: http://www2.bishop museum.org/HBS/checklist/

Hawaii Cooperative Park Service Unit. 1990. Hawaii stream assessment. A preliminary appraisal of Hawaii's stream resources. Prep. for State of Hawaii, Commission on Water Resource Management. National Park Service, Hawaii Cooperative Park Service Unit, Rept. No. R84: 294 pp.

Macdonald, G. A., A. T. Abbott, and F. L. Peterson. 1983. *Volcanoes in the Sea. The Geology of Hawaii*. 2nd Edition. University of Hawaii Press, Honolulu. 517 pp.

Marine Corps Base Hawaii. 2006. Final Marine Corps Base Hawaii Integrated Natural Resources Management Plan Update (MCBH INRMP) (2007-2011). November 2006.

McRae, M. G., and J. M. Fitzsimmons. 2002. Downstream migration of newly hatched amphidromous organisms in Hakipu`u, Waikane, Waiahole, and Kahana streams. Prep. for Dept. Land and Natural Resources, Hawaii Division of Aquatic Resources. Louisiana State University, Museum of Natural Science. 18 pp.

Nagata, K. M. 1988. Botanical survey: Waikane project area, Koolaupoko, Oahu. Report prepared for Group 70.

Nishida, G. M., ed. 2002. Hawaiian Terrestrial Arthropod Checklist. Fourth edition. *Bishop Museum Technical Report* 22. Honolulu. iv + 313 pp.

Office of State Planning (OSP). 1995. Waiahole-Kualoa Project. Preliminary assessment of potential water demand for economic and instream uses in the Waiahole-Kualoa Region. Office of State Planning, State of Hawai'i. February 1995. 45 p. + app.

Palmer, D. D. 2002. *Hawaii's ferns and fern allies*. University of Hawai'i Press, Honolulu. 352 pp.

Staples, G. W. and D. R. Herbst. 2005. *A Tropical Garden Flora. Plants Cultivated in the Hawaiian Islands and other Tropical Places*. Bishop Museum, Honolulu. 908 pp.

State of Hawaii - Department of Land and Natural Resources (DLNR). 1998. Indigenous Wildlife, Endangered And Threatened Wildlife And Plants, And Introduced Wild Birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule §13-134-1 through §13-134-10, dated March 02, 1998.

Tomich, P. Q. 1986. *Mammals in Hawaii*. Bishop Museum Press. Honolulu, Hawaii. 375 pp.

Tuggle, H. D. and B. A. Wilcox 1998. Strategic integrated resources management planning for selected properties of Marine Corps Base Hawaii: Camp H.M. Smith, Puuloa Training Facility, and a portion of Waikane Valley. Report prepared for MCBH through contract to the U.S. Army Corps of Engineers, Honolulu.

U.S. Fish and Wildlife Service (USFWS). 1998. Recovery Plan for the Hawaiian Hoary Bat. U.S. Fish & Wildlife Service, Portland, Oregon. May 1998.

______. 1999a. Hawaiian Islands Plants: updated November 29, 1999: Listed and Candidate Species, as designated under the U.S. Endangered Species Act. U.S. Government Publication.

______. 1999b. Endangered and Threatened Wildlife and Plants. Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petitions, and Annual Description of Progress on Listing Actions. *Federal Register*, 64 (205; Monday, October 25, 1999): 57534-57547.

______. 2001. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Oahu Elepaio (*Chasiempis sandwichensis ibidis*); Final Rule. *Federal Register*, 66 (237; Monday, December 10, 2001): 63752-63782.

______. 2002. Threatened Wildlife and Plants. Review of Species That Are Candidate or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petition; Annual Description of Progress on Listing Actions. *Federal Register*, 67 (114; Thursday, June 13, 2002): 40657-40679.

______. 2005. Endangered and Threatened Wildlife and Plants. Review of Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petition; Annual

Description of Progress on Listing Actions. *Federal Register*, 70 (90; Wednesday, May 11, 2005): 24870-24934.

______. 2010. USFWS Threatened and Endangered Species System (TESS), online at URL: http://ecos.fws.gov/tess_public/StartTESS.do

Vanderwerf, E. 1993. Report from a 3-day hike on the Ko'olau Summit Trail, '*Elepaio,* 53:12(79).

Wagner, W. L., D. R Herbst, and S. H. Sohmer. 1990. *Manual of the Flowering Plants of Hawai'i*. University of Hawaii Press, Honolulu. 1854 pp.

______ and ______. 1999. *Supplement to the Manual of the Flowering Plants of Hawai'i.* Pp. 1855-1918 *in:* Wagner, W. L., D. R. Herbst, and S. H. Sohmer, *Manual of the Fowering Plants of Hawai'i.* Revised Edition. 2 vols. University of Hawaii Press and Bishop Museum Press, Honolulu.

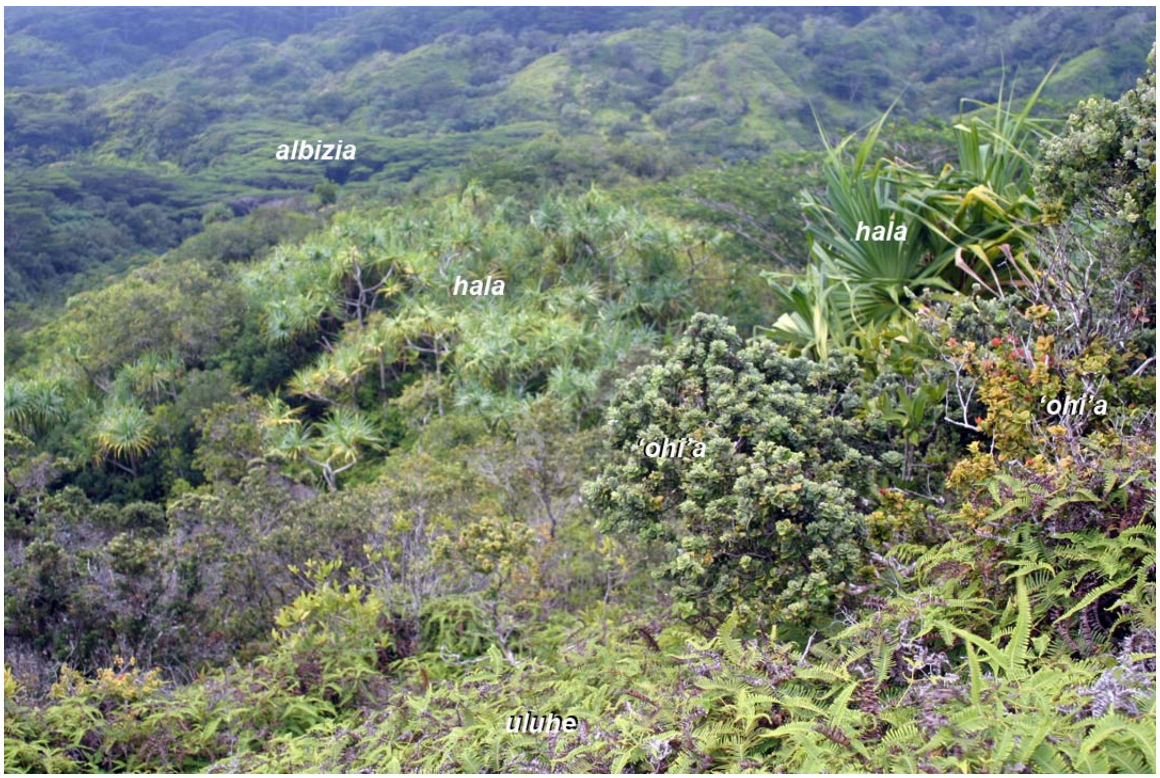
Whistler, A. 2003. Botanical report, proposed Marine Corps Jungle Warfare Training Area. Prep. for Wil Chee Planning, Honolulu. Isle Botanica, Honolulu. 12 pp.

Zimmerman, E. C. 1948- 80. *Insects of Hawaii*. University of Hawai'i Press, Honolulu.

______. 1948. *Insects of Hawaii. Volume 1. Introduction*. University of Hawaii Press, Honolulu. xx + 206 p.

Appendix A. Native Plant Species of Concern

The following descriptions were prepared following botanical field work for use by USA Environmental in training field personnel to avoid damaging native plants encountered during the EOD operations. "Species of Concern" in this case are plants that are native and growing in work areas, but do not necessarily have status with respect to any state or federal laws.



Picture looking down into the valley from an area of natives near the top of one of the AOCs. Recognizable species are labeled.

The native plants considered to be of greatest concern in the Waikane Valley Impact Area are described and pictured here. The complete list of plants found in the area (Appendix B) includes a few other native and Polynesian introductions (such as *hau*) which are, however, so common around the islands that no special consideration is warranted. A majority of the plants growing in the four AOCs are non-native (introduced and naturalized or escaped ornamental plant species). With a few exceptions, the native species are most abundant at elevations higher than the AOCs, with very few (except *hau*) found close to the valley bottom. Specimens of the endemic olive, *olopua* (*Nestegis sandwicensis*) and *koa* (*Acacia koa*), were located just upslope of AOC 1 (*olopua*) and AOCs 1, 2 and 3 (*koa*). These trees are large and not threatened by project activities. *Olopua* is a rare find and not discussed further. Otherwise, plants are described here roughly from most to least significant in terms of concern for their welfare during the EOD cleanup activities.

Fam. FABACEAE
Acacia koa ~ *koa* (endemic tree)

Koa leaves with flowers

Moderate to large tree with dark, rough bark (in older trees) and distinctive, light green, falcate (sickle-shaped) leaves called phyllodes. Most specimens were observed near the very top of the AOCs; some scattered trees were found between the AOCs at lower elevations. Although not a listed species, this tree is a significant member of the native plant community. Seedlings are numerous throughout the project area, but no saplings were noted, indicating poor natural seedling survival

(reason unknown). Seedlings (typically under six inches in height) and saplings have compound leaves, resembling *koa haole*.
RECOMMENDATIONS: avoid damaging trees and saplings; seedlings can be ignored.

Fam. Myrtaceae

Metrosideros polymorpha ~ *ʻōhiʻa* (endemic tree or shrub)

ʻŌhiʻa is extremely variable in form, although at this location most plants are either small trees or shrubs. Shrubby growth is typical on poor (ridge) soils. Bark is fissured and flaky. Leaves are stiff, rounded elongate rounded with short petioles (leaf stalk) and often oriented at right angles to the stem, giving a layered appearance on shrubby growth . Leaves may be gray-green or variously discolored and with raised bumps caused by a gall wasp. At the project site, this plant is common in some areas, and not in others, although the species is most abundant towards the upper ends of the AOCs. Not a listed species and common at higher elevations on Oʻahu, this tree is a significant member of the native plant community.

Left: *ʻŌhiʻa* leaves and flowers. At this time (March), plants in Waikane have fruits but no flowers; fruits are eucalyptus-like, resembling small, woody cups. Right: *ʻŌhiʻa* leaves and fruit

RECOMMENDATIONS: Avoid damaging older trees; shrubs on ridgelines are probably also old, but stunted.

Fam. Pandanaceae
Pandanus tectorius ~ *hala* (indigenous tree)

Hala or *Pandanus tectorius* leaf crowns with ripe fruit

Hala with native *uluhe* fern in foreground

Hala or screw-pine is a distinctive plant with typically one main trunk branching several times and bearing near the ends, spirally-arranged, sword-shaped leaves. These are typically edged with spines. Large, segmented fruits vaguely resemble a pinecone or pineapple. Strong prop-roots develop near the base of the trunk. This species is very common throughout the area at all elevations. RECOMMENDATIONS: Avoid damaging trees. Seedlings can be locally numerous, but most under the adult canopy will not survive and can be disregarded.

Fam. Goodeniaceae
Scaevola gaudichaudiana ~ *naupaka kuahiwi* (endemic small shrub)

Naupaka is a familiar plant near the beach, and this mountain cousin is instantly recognized as a relative by the flowers that appear only half-formed (all the petals are on one side). Leaves are green, soft and toothed on towards the pointed end. Fruit is a small and football shaped, green then maturing purple. Generally uncommon in the project area, appearing as isolated, broad shrubs (under 1 m in height) along the ridgeline associate with other natives such as *uluhe* (fern), shrubby *ʻōhiʻa*, and *ʻakia*. No formal protection is afforded this native, but plants should not be removed if at all possible. RECOMMENDATIONS: preserve in place. Removal of nearby non-native octopus tree and shoebutton ardisia may help struggling native plants survive.

Naupaka kuahiwi with fruit and flowers.

Fam. Thymelaeaceae
Wikstroemia oahuensis ~ *ʻākia* (endemic shrub, can become small tree)

Typically low (usually under 1.5 m) and twiggy, ʻ*ākia* has bright green to dark green, elliptic or ovate leaves. Main stems have smooth, grayish to reddish brown bark, with white ring patterns. Flowers are green to yellow, but small and usually occur singly or in clusters at or near the branch tips. Plants uncommon in the project area, usually associated with *ʻōhiʻa*, *naupaka*, and open areas surrounded by *uluhe* along ridgelines in the upper parts of the AOCs. RECOMMENDATIONS: given the rarity of these plants in this area (although widespread on open ridgelines around Oʻahu), the plants should be left undisturbed. The plants here are leggy and the ground around them easily exposed for examination.

ʻĀkia with leaves and flowers. New leaves are lime green.

Fam. Epacridaceae
Styphelia tamaeiameia ~ *pūkiawe* (indigenous shrub)

Pūkiawe is rare in the AOCs, but a few specimens were encountered, usually associated with *ʻakia* and shrubby *ʻōhiʻa.* This plant is distinguished by closely spaced, small leaves and small, globular, red fruit. The leaves usually have a small awn or style at the tip. RECOMMENDATIONS: very few plants occur here. Although not rare elsewhere, these plants should be left undisturbed.

Pūkiawe bush with leaves and fruit.

Fam. Rosaceae
Osteomeles anthyllidifolia ~ *'ulei* (indigenous shrub)

Like *pūkiawe*, *'ulei* is rare in the AOCs, and probably much more common far upslope. The leaves are compound, shiny dark green, and the plant grows low and spreading, usually on open ridgelines. Flowers resemble small, white roses. Fruits are globular, and ripen whitish with reddish specks.

Only a few small specimens were seen in the AOCs, near the higher ends in places having other native shrubs and *uluhe* fern. RECOMMENDATIONS: very few plants occur here. Although not rare elsewhere, these plants should be left undisturbed.

Closeup of *ulei* leaves and flowers

Native ferns

Two ferns abundant in the AOCs are native: *uluhe* (*Dicranopteris linearis*) and *palaʻa* (*Spenomeris chinensis*). Both are indigenous (native, but also found in other parts of the world). *Uluhe* is easily recognized by the tangled mats formed in mostly very open areas along ridgelines and steep margin slopes. These mats are very difficult to penetrate if the ferns are growing more than 0.5 m high.

Stipes coming out of the trunk of *hāpuʻu* are coated in golden- brown hairs.

Palaʻa (photo not available) occurs in scattered clusters in open or partially shaded areas of the AOCs, often where the soil is poor. In some situations, clusters of *palaʻa* are adjacent to clusters of non-native goldback fern (*Pityrogramma austro-americana*). *Palaʻa* is one of the most common native ferns in Hawaiʻi.

One other endemic fern occurs in the area, although mostly rare and limited to gulches in or between AOCs: *hāpuʻu* (*Cibotium chamissoi*) or Hawaiian tree fern. Tree ferns are easily recognized by their "trunk" supporting a broad crown of bright green fronds. *Hāpuʻu* is characterized by the basal part of each frond (called the stipe) coated with wooly mustard or reddish-brown hair.

RECOMMENDATIONS: The ground under an *uluhe* mat cannot be examined unless the mat is removed. This fern can be expected to recover quickly after removal as it is an early colonizer on landslide and other disturbed slopes. Removal of non-native trees and shrubs will encourage the return of *uluhe*. *Palaʻa* also can be removed as needed to complete the work. Some clusters where the fern is tallest (up to 0.5 m) may need to be cleared to inspect the ground. RECOMMENDATIONS: clear all dense fern growths as needed. Avoid damaging or removing *hāpuʻu* ferns.

This photo shows *uluhe* fern and growths of the fern ally, *wāwaeʻiole* (*Lycopodiella cernua*; middle and bottom). The latter is rare in the AOCs, but not of concern.

Document Title: Draft Final Remedial Investigation Report

March 18, 2011

Reviewer: Steven Mow, Hawaii Department of Health

Date: April 15, 2011

Comment No.	Section No.	Comment
1	Page 6-2, Section 6.2 “MEC HA Results”	The response to comment #2 is unacceptable. In your response, you state the following: “The EPA Guidance “Munitions & Explosives of Concern Hazard Assessment Methodology” (Interim, October 2008) Chapter 5 does provide typical characteristics of an MRS associated with each hazard level but **does not** relate the hazard level to the allowable land use.” Yet in Chapter 6, Section 6.1 (MEC HA Methodology) of your report, you state the following: “It also provides an assessment of relative hazard reduction associated with **changes in land use** and various remedial action alternatives…” So my question again is how do the hazard rankings (high, medium, low) relate to the allowable land uses for the property?
Response: The previous response was accurate in stating that the MEC HA methodology does not relate the hazard level to the **ALLOWABLE** land use, but was somewhat misleading. To clarify, the MEC HA methodology applies different remedial alternatives to current and future land use **SCENARIOS** and gives us a risk level for each remedial action under that scenario. We use those risk levels in the 9 criteria analyses during the feasibility study. But that does not mean that these land use scenarios are going to be approved by DDESB. The Recommendations section identifies the **ALLOWABLE** future land uses that have been coordinated with and have a reasonable chance of gaining DDESB approval.		

Document Title: Draft Final Remedial Investigation Report

March 18, 2011

Reviewer: David Henken, RAB Co-Chair

Date: May 2, 2011

Comment No.	Section No.	Comment
1	General	With respect to the recommendations section (which was the focus of my comments on the prior draft), it appears that, rather than propose alternatives that would allow greater access to the target area and non-target area, the Marines have backed off from the alternative of allowing unrestricted access to even the 34-acre area in the southernmost portion of the property. That seems to be moving things in the wrong direction, as the community is committed to returning as much of the property as possible to productive and culturally appropriate use.
Response: The Marine Corps remains committed to finding alternatives that provide as much access to the southernmost portion of the property as Department of Defense will allow. We also are seeking alternatives that allow greater access to the target and non-target areas. Our proposed alternatives are being coordinated with DoD Explosives Safety Board to determine which alternatives allow the greatest access. The ensuing Feasibility Study will analyze the alternatives to provide a recommendation that effectively addresses the MEC problem, that is implementable, and that is acceptable to the stakeholders. The regulators and the community will have the opportunity to review the FS recommendations and provide comments. The Marine Corps will also brief the Restoration Advisory Board (RAB) and community on the FS recommendations at a RAB meeting following release of the draft Feasibility Study.		