

**Final**

# **Range Condition Assessment Hawaii Land-Based Operational Range Complex Decision Point 1 Recommendations Report**

**PEARL HARBOR COMPLEX, NAVAL MAGAZINE PEARL  
HARBOR, OAHU, HAWAII AND  
PMRF BARKING SANDS, KA'ULA ROCK, KAUAI, HAWAII**

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## EXECUTIVE SUMMARY

### INTRODUCTION

This Decision Point 1 Recommendations Report provides the findings of the Hawaii Land-Based Operational Range Complex Range Condition Assessment (RCA). This Operational Range Complex consists of the 1) Navy Munitions Command, East Asia Division, Detachment (NMC EAD DET) Pearl Harbor, West Loch Branch, Oahu, Hawaii; 2) Ka'ula Rock; and 3) Pacific Missile Range Facility (PMRF) Barking Sands, Kauai, Hawaii. RCA's are part of the U.S. Navy's Range Sustainability Environmental Program Assessment (RSEPA), which satisfies the requirements of Department of Defense Instruction (DoDI) 4715.14, Operational Range Assessments. All RCA activities were performed according to the Navy Performance Work Statement (NAVFAC, 2004), RSEPA Guidance Manual (Chief of Naval Operations (CNO), 2006), and the RCA Notification Package (ECC, 2005). The purpose of RSEPA is to support the sustainment of Navy ranges by assessing and managing the present environmental condition of each U.S. Navy land-based operational range where munitions-related activities have occurred. The findings and recommendations in this report will support range managers in making informed decisions that ensure range compliance with environmental laws and regulations and protection of public health and the environment. This Executive Summary provides a concise assessment briefing of the Hawaii land-based operational ranges with additional supporting details provided in the follow-up body of this report.

The RCA consists of three phases: Range Selection (Phase I), Pre-Site Visit Information Collection (Phase II), and On-Site Visit Information Collection (Phase III). Phase III entails the majority of the RCA process, including an on-site visit and assessment of range environmental programs, the Operational Range Site Model (ORSM) and Predictive Modeling for munitions-related testing and training activities and the conclusions and recommendations that support RSEPA Decision Point 1. Figure 1-1 provides an overview of the RSEPA process. The latest RSEPA Guidance Manual distinguishes small arms ranges from other land-based ranges in that they are assessed separately.

### BACKGROUND

The U.S. Pacific Command (USPACOM), headquartered in Pearl Harbor, Hawaii, is responsible for maintaining national security of the Asia-Pacific region. For the Hawaiian Islands, USPACOM is represented by Commander, U.S. Pacific Fleet (COMPACFLT). Accordingly, COMPACFLT supports the theater strategy of USPACOM, and provides interoperable, trained and combat-ready naval forces to USPACOM and other U.S. unified commanders. The Goldwater-Nichols Act enacted by Congress in 1986 transitioned COMPACFLT from warfighter to that of force provider, sustainer, and trainer for the unified commanders.

The Hawaii Land-Based Operational Range Complex is comprised of land assets, supporting military facilities, and restricted military airspace. The range complex consists of the West Loch Explosive Ordnance Disposal (EOD) Training Range, Oahu; Ka'ula Rock, near Kauai; and Pacific Missile Range Facility (PMRF) Barking Sands, Kauai.

West Loch EOD Training Range consists of a 2.75-acre facility located at NMC EAD DET Pearl Harbor, West Loch Branch, Oahu, Hawaii. This range is located adjacent to the Pearl Harbor Complex at Lima Landing in the south-central coast area of the island of Oahu. The range contains three concrete blast structures in which EOD training is conducted.

Ka'ula Rock is the only land area associated with the Hawaii Offshore Ranges and is located approximately 60 miles southwest of PMRF Barking Sands, Kauai, Hawaii. Ka'ula Rock, one of the smallest of the Northern Hawaiian Islands, is approximately 1 mile long and ¼ mile wide (area of 0.25

square miles or 160 acres). The island is crescent shaped and is generally comprised of steep cliffs on all sides ranging from 100 to 150 feet above mean sea level with no beaches.

PMRF is the largest instrumented multi-environment training and test range in the world. The Range Operations Control Center (ROCC) is the operational center of the PMRF ranges and is located at Barking Sands on the south-southwestern shore of the island of Kauai. The operational land area of PMRF (estimated 500 acres) supports multiple launch pads, operations and control facilities, aircraft hangers, administrative and personnel housing, warehouse storage, electrical power generation facilities, a 10,000-foot paved runway with taxiways, and an underground missile storage magazine. PMRF includes three land-based operational ranges (North Launcher, THAAD/50K, and DOE KTF).

## **RCA PHASE I: RANGE SELECTION**

In accordance with the 2006 RSEPA Policy Implementation Manual, during RCA Phase I, Navy ranges are selected for assessment if they are land-based, not closed, and have a history of testing or training using munitions. Other considerations are the range's role to the overall Navy mission, known environmental condition and interest to the public. Based upon these considerations, the Chief of Naval Operations (OPNAV) N45, Range Assessments Division, in conjunction with the HRC RCA Management Team determined that West Loch EOD Training Range at NMC EAD DET Pearl Harbor, West Loch Branch, Oahu, Ka'ula Rock (island southwest of PMRF), and three ranges (North Launcher, THAAD/50K, and DOE KTF) at PMRF would be assessed in this RCA. They are the only designated land-based operational range areas within the Hawaii Range Complex that have either conducted or currently do conduct munitions-related operations.

### ***West Loch EOD Training Range***

The West Loch EOD Training Range is operated by EOD Mobile Unit THREE Detachment Middle Pacific for conducting EOD training and demolition requalification for EOD technicians. Land-based demolition training occurs at the range. The range is approved for up to 2.5 pounds Net Explosive Weight (NEW). West Loch EOD Training Range is used for training in demolition and explosive ordnance disposal procedures. Emergency destruction of unstable ordnance has infrequently been conducted at this range. West Loch EOD Training Range operations include land area, scheduling system, communications system, and target system.

### ***Ka'ula Rock***

Ka'ula Rock is a remote island located 60-miles southwest of PMRF that is covered by a sparse grass landscape and earthen / rock outcrops. This area is reportedly underlain by a relatively thin soil layer and highly weathered limestone bedrock. The southern end of the island is used for range-related activities. The majority of the island is left undisturbed with some of it designated as a bird sanctuary. The Ka'ula Rock is operated by USPACOM, COMPACFLT Systems Commands, and FACSFAC to support critical sustainment training for Navy and Marine Corps units. Ka'ula Rock serves as an air-to-ground target located within restricted zone R-3107. Ka'ula Rock operations are limited to inert air-to-ground ordnance only. From November through May, 20-mm and 30-mm cannon fire is not authorized for this island. Naval Surface Fire Support (NSFS) is never authorized at Ka'ula Rock. Ka'ula Rock operations include land area, scheduling, communications, weather observation, and target systems.

### ***Pacific Missile Range Facility***

The operational land area of PMRF (estimated 500 acres) supports multiple launch pads, operations and control facilities, aircraft hangers, administrative and personnel housing, warehouse storage, electrical power generation facilities, a 10,000-foot paved runway with taxiways, and an underground missile storage magazine. For purposes of this RCA, only three missile launch pads will be assessed as land-based operational ranges in accordance with RSEPA (CNO 2006). PMRF includes three land-based

operational ranges (North Launcher, THAAD/50K, and DOE KTF). PMRF includes three sites as follows: 50K Launcher / Terminal High Altitude Area Defense (THAAD) Launch Area; North Launch Area; and Department of Energy (DOE) Kauai Test Facility. PMRF is operated by USPACOM and COMPACFLT Systems Commands to support critical testing and training for the Navy, Army, Marine Corps, U.S. Coast Guard, Hawaii Air National Guard, and Department of Energy. This facility provides support services for fleet anti-submarine warfare (ASW), anti-surface warfare (ASUW), anti-air warfare (AAW), electronic combat (EC), command and control warfare (C2W), amphibious warfare (AMW), ballistic missile defense (BMD), and mine warfare (MIW). PMRF's research, development, test and evaluation (RDT&E) mission includes providing support for tactics development, and test and evaluation. PMRF operations include land area, scheduling, communications, weather observation, and target system.

## **RCA PHASE II: DOCUMENT COLLECTION AND ON-SITE VISIT PREPARATION**

The purpose of RCA Phase II, "Pre-Site Visit Information Collection", is to gather relevant environmental and range/operational documents that will assist RCA Technical Team members in assessing range and environmental program management practices, and the environmental condition of the HRC. The HRC RCA Phase II occurred from June – July 2005.

All range, installation and environmental program stakeholders at PMRF, West Loch EOD, and Ka'ula Rock were notified and provided information about the start of the RCA and provided information describing the HRC RCA process. A Range Management In-brief was held with range management personnel. Additionally, appropriate staff representatives of Navy Region Hawaii and NAVFAC Pacific were also interviewed and asked to provide documents and information necessary for the Technical Team to review. All interviewees were provided a "read-ahead" Notification Package in advance of the scheduled Technical Team site visit in RCA Phase III.

## **RCA PHASE III: ON-SITE VISIT ASSESSMENT**

The RCA Technical Team, comprised of on-site support contractors, and staff members from Navy Region Hawaii and COMPACFLT conducted the RCA Phase III "On-Site Visit Information Collection and Review", during the week of 20 July 2005.

During the site visit, the Technical Team interviewed key range managers, and Navy Region Hawaii and COMPACFLT environmental program managers. Additional range, operational, and environmental records were collected at this time. Interview forms from the RSEPA Policy Implementation Manual (RSEPA Forms 6 through 16) were used to acquire and record the information needed to assess the environmental regulatory compliance of the ranges. Interview forms are tailored to address range compliance with the following U.S. Navy Environmental Program areas:

- Air Quality
- Water/Wastewater
- Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste
- Cultural Resources
- Natural Resources
- Emergency Planning and Community Right to Know Act (EPCRA)
- Environmental Planning
- Range Environmental and Explosives Safety Management

- Installation Restoration (IR)
- Storage Tank and Petroleum, Oil, and Lubricants (POL) Management
- Safe Drinking Water

The Navy Region Hawaii and COMPACFLT environmental programs that oversee the environmental management of the Hawaii Range Complex area were determined to be in compliance with applicable U.S. Navy environmental program requirements. Technical Team members did develop recommended measures to improve range management which are detailed in the following Decision Point 1 section. A short summary for each range is provided below which gives an explanation of rationale for making the range management improvement recommendations.

Recommendations for range management improvements at West Loch EOD were based on: 1) current facilities with security measures / protocols; 2) site use for current 2.75-acres adjacent to Pearl Harbor West Loch channel; 3) current approved 2.5-pounds NEW with future expansion to 5.0-pounds NEW; 4) environmental conditions including a brackish aquifer underlying the site; and 5) low probability of exposure to human receptors to MC's in significant concentrations.

For Ka'ula Rock, range management improvement recommendations were based on 1) isolated, uninhabited island; 2) limited, controlled site access due in part to steep topography and a large marine bird population; 3) current site use and environmental conditions for the southern end of island; 4) current use of inert and practice ordnance; and 5) no MC related pathway / receptor interactions associated with the range.

Recommendations for range management improvements at PMRF Barking Sands were based on 1) current facilities with security measures / protocols; 2) current use and environmental conditions for North Launcher, THAAD/50K, and DOE KTF as missile / rocket launch pads; 3) close proximity to Majors Bay and designated recreational waters; and 4) no MC related pathway / receptor interactions associated with the ranges.

A review of environmental regulations / site databases and interviews with range managers found the Hawaii Range Complex sites compliant with select federal regulations.

Technical Team members' assessments of environmental programs' compliance with respect to management of the West Loch EOD, Ka'ula Rock, and PMRF range areas are also provided in detail within the report. Assessments are based upon the information gained during interviews and from supporting documents. Environmental Program Managers answered questions only with respect to their knowledge of their individual programs. Records review provided additional information beyond the scope of program managers' personal experience or knowledge.

## **OPERATIONAL RANGE SITE MODEL (ORSM)**

ORSMs are used in RSEPA to characterize land-based ranges for the purpose of determining possible sources of munitions constituents (MCs), pathways of movement of MCs, and possible human and ecological receptors. ORSMs are also used to determine where predictive modeling is needed to assess the risk of off-range releases of MCs.

### **West Loch EOD**

The West Loch EOD ORSM summarized in this section supports the Technical Team's assessment that munitions-related activities conducted at the range did not warrant further analyses due to the small quantities of MCs associated with EOD training. Based upon the types and quantities of live munitions

that were recorded to have been used at West Loch, the estimated source loading of residual MCs at the EOD was conducted and reported in Section 4.1.8 of this report.

### Operational

From the mid-1960's through 1987, the EOD Training Range was used for open detonations (i.e., RDX, PETN) for training purposes. While the authorized NEW for the range during this period is not known, between 10 and 20 pounds non-fragmenting NEW were typically expended per shot. Open detonations were halted due to the establishment of Navy classroom facilities and their close proximity to the range. In 1991, a request for site approval and explosive safety certification was submitted for conversion of the open detonation site (Class "D") into an EOD training range. The EOD Training Range was approved in 1992 for 2.5 pound NEW, Hazard Class/Division 1.1 uncased, non-fragmentation producing explosives.

Current and foreseeable future operations include increasing the explosive limit of the Level 1 and Level 2 emergency detonations from 2.5 to 5.0 pounds NEW which would allow EODMU-3 Detachment MidPac to use a greater percentage of their training tools and instruments.

### Land Use

The current and projected future use of the range is for explosives training operations. No other military operations are conducted at the EOD Training Range. ESQD arcs emanating from the ordnance magazines restrict land use around the range. There are no public land uses at the EOD Training Range. Civilian access to the range is restricted by security personnel.

### Environmental

The 2.75-acre range area is relatively flat, with a ground elevation of approximately 10 feet above sea level. The surface rises gradually from shoreline inland, and there are no sharp changes in grade within NMC EAD DET Pearl Harbor, West Loch Branch or the EOD Training Range. No surface drainages were apparent within the range boundaries; the permeable nature of the soils at the range leads to drainage by percolation rather than sheet flow. However, sheet flow may occur over short distances during brief heavy storms, which would cause surface runoff to flow slowly to the east towards Pearl Harbor. Limestone cliffs up to 10 feet high overlook Pearl Harbor on the east side of the NAVMAG.

Vegetation near the blast structures is limited to low-lying grasses and shrubs with large sections of exposed soil. The western, northern, and eastern edges of the EOD Training Range consist of medium-growth shrubs and medium to tall sections of trees. The southern edge of the EOD Training Range consist of a larger quantity of medium to tall trees than areas noted above as this area is located outside the ESQD. As required by NAVSEA OP 5, all vegetation including dry grass, leaves, and other combustible materials is removed within a radius of 50 feet from the points of detonation.

No surface water bodies or drainages are present within the boundaries of the range. Pearl Harbor, located 150 feet east of the larger detonation point, is classified as a Class 2 inland estuary. Industrial, agricultural, recreational, and fishery activities are permitted in these waters, but new industrial discharges are restricted (Earth Tech, 2004). The 'Oki'okiolepe Fish Pond, a cultural resource site, is located 425 feet north of the range.

Three aquifer systems are present at NMC EAD DET Pearl Harbor, West Loch Branch, located within the three geologic formations described above. All three aquifers consist of brackish water, with the limestone aquifer exhibiting the lowest salinity. The potential exists for the limestone aquifer to be used as a source of groundwater for salt tolerant agriculture. Groundwater in the lower two zones is too highly

saline to have any utility (INRMP, 2001). None of the three groundwater zones is considered useful as a drinking water source (Earth Tech, 2004). Depth and direction of groundwater flow at the EOD Training Range are not known. As the range is located near Pearl Harbor, a shallow groundwater zone exists very close to the surface, approximately from 10 to 15 feet below ground surface. This shallow, brackish groundwater is tidally influenced and in direct hydraulic contact with Pearl Harbor. A review of existing monitoring wells at NMC EAD DET Pearl Harbor, West Loch Branch, indicates that shallow groundwater generally flows northeast to east toward Pearl Harbor (Earth Tech, 2004). There are no water production wells in close proximity to the EOD Training Range or NMC EAD DET Pearl Harbor, West Loch Branch. Drinking and irrigation water is piped to NMC EAD DET Pearl Harbor, West Loch Branch, from Federally-owned water supply wells (Earth Tech, 2004). The closest drinking water wells are the Honouliuli Wells, located approximately 2 miles north and upgradient of the installation.

There are no sensitive ecosystems, including wetland systems, within the EOD Training Range boundaries. T&E species are not known to be present within the range, but have been observed just outside the range's northwest perimeter. These T&E species include four types of water birds (Black-necked Stilt, Common Moorhen, American Coot, and Hawaiian Duck) which are observed regularly at the Honouliuli Unit of the Pearl Harbor Wildlife Refuge located on the northwest tip of the installation. Although these endangered water birds have been identified as possible inhabitants of the EOD, data collected from limited training activities performed at the range indicates that these water birds would not be affected and subsequently no critical habitat has been designated for these species (INRMP, 2001). The State-endangered Short-eared owl and other migratory birds may also be present at NMC EAD DET Pearl Harbor, West Loch Branch.

There are no known cultural resources within the boundaries of the EOD Training Range. However, the 'Oki'okiolepe Fish Pond is located 425 feet north of the range. This site is listed on the National Register of Historic Places (NHRP) as it is one of few ponds left in Pearl Harbor, where many had previously existed (INRMP, 2001). The pond consists of an approximately 650-foot long wall which encloses approximately 4.5 acres. The site is located within the ESQD arc for the EOD Training Range. Surface runoff from the range is unlikely to reach the pond, given the greater likelihood for infiltration and close proximity of discharge to Pearl Harbor, 150 feet to the east of the range. The pond is cross-gradient to the range, limiting potential groundwater discharge from the range to the pond. There are no IRP sites within the boundaries of the EOD Training Range.

#### West Loch EOD ORSM: Assessment

Historical records and interviews indicate that live munitions used during EOD training would have been responsible for the deposition of the majority of residual explosives at West Loch. Section 4.1.6 discusses the munitions expenditures and constituents profile data results for the West Loch EOD and the small quantities explosives used on annual basis on the range. No laboratory data exists to demonstrate transformation or transport of HMX, RDX, and TNT either on or off-site. Risk assessment indicates that human receptors are limited to range users and level of risk is acceptable for all range users.

Section 4.1.10 provides a summary of the ORSM results for the West Loch EOD range. Based on the small quantities of explosives and used at the range on an annual basis and the low probability of exposure to human receptors to MCs in significant concentrations, no further analysis is required to assess risk of off-range release of MCs at the EOD Training Range. This range will be re-evaluated when the RCA is repeated in five years.

#### ***Ka'ula Rock***

The Ka'ula Rock ORSM supports the Technical Team's assessment that the inert and practice munitions-related activities conducted at the Ka'ula Rock are not a significant source of MCs and have not posed an

unacceptable risk to public health and the environment for this remote uninhabited island. For these reasons and based upon RSEPA Policy Implementation Manual guidance (Rev. 1) (CNO, 2006) that Predictive Modeling is only necessary where live munitions are used, no further analyses was conducted for munitions-related testing in the Ka'ula Rock area.

### Operational

The Ka'ula Rock range is operated by USPACOM, COMPACFLT Systems Commands, and FACSFAC Pearl Harbor to support critical readiness training for Navy and Marine Corps units. Ka'ula Rock serves as an air-to-ground target located within restricted zone R-3107. Ka'ula Rock operations are limited to inert air-to-ground ordnance only. From November through May, 20-mm and 30-mm cannon fire is not authorized for this island. Naval Surface Fire Support (NSFS) is never authorized at Ka'ula Rock. Ka'ula Rock operations include land area, scheduling, communications, weather observation, and target systems.

Current users of the range include the Navy, Marine Corps, Air Force, and Air National Guard. Since the Navy owns the range, all records including ordnance expenditures are captured, recorded, and tracked by the Navy. Regular range clearance operations are not conducted on the range. No records of any ordnance removals were located. Maintenance activities are limited to helicopter drops of new targets. The large numbers of birds that frequent the island significantly hamper and limit helicopter operations. The range control office indicated that only inert or practice munitions were authorized for use on the range and contain no explosives. Lead as MCs originate from .50 caliber and 7.62 mm ammunition (see below). Pyrotechnic cartridges (MK 4 Mods or CXU-3A/B2) are used in LGTRs. The 2.75-inch rockets also contain pyrotechnic charges and may contain unburned solid fuel rocket propellant (see below). The following is a description of each of the 11 munition items/small arms listed in the available expenditure records.

#### **.50 caliber**

- Average .50 caliber round contains 1.42 oz (.08875 lb) of lead
- Average .50 caliber round contains 0.343 lbs of smokeless powder propellant (not a RSEPA MC of concern)

#### **7.62 mm**

- Average 7.62mm round contains 0.268 oz ( 0.0167 lbs) of lead
- Average 7.62mm round contains 0.066 lbs of smokeless powder propellant (not a RSEPA MC of concern)

#### **20 mm**

- Practice munition does not contain an explosive filler

#### **BDU-45**

- Practice munition does not contain an explosive filler
- Contains a 0.01 lbs Titanium Tetrachloride spotting charge – Not a MC of concern in RSEPA

### **LGTR**

- Generic description for several classes of practice munitions, including bombs, projectiles, or rockets; does not contain an explosive filler
- Cannot determine if spotting charge is used, as the exact type of LGTR used is not indicated in the TRIMS data

### **MK-9**

- Practice munition does not contain an explosive filler
- Contains a spotting charge – Not a MC of concern in RSEPA

### **MK-48**

- Practice munition does not contain an explosive filler; no spotting charge

### **MK-76**

- Practice munition does not contain an explosive filler
- Contains a 0.01 lbs Titanium Tetrachloride spotting charge – Not a MC of concern in RSEPA

### **MK-82**

- Inert training bomb – does not contain an explosive filler
- Contains a spotting charge – Not a MC of concern in RSEPA

### **2.75" Rocket**

- Inert warhead - does not contain an explosive filler
- Contains a double-base propellant (ballistite); perchlorate not a component of inert rocket warhead or motor

### **AIM-9L**

- Inert warhead – does not contain an explosive filler

Future operations are summarized in the Draft Joint Hawaii Range Complex Management Plan which suggests that the Navy consider allowing live ordnance as well as NSFS training at the range. Range control personnel interviewed during this RCA were unaware of any definite plans by the Navy to change the use of the range.

### Land Use

The current and projected future use of the range is for inert training operations. The island is owned by the Navy; only the southern portion is authorized for munitions training. The public does not have access to or use of the island.

## Environmental

Ka'ula Island is a crescent-shaped remnant portion of a tuff cone formed on the southeast side of a submerged shield volcano that was truncated by erosion (see Section 4.3.2: Figures 4-8, 4-9, and 4-10). The tuff cone making up the island was formed by hydro-magnetic volcanic explosions that occurred well after the eruption of the underlying shield volcano. Ordnance firing is limited to the first 1,000 feet of the southeastern tip (also known as Target Area) of the island (approximately 10 acres). The remainder of the island is a State Bird Sanctuary as designated May 1978 (PMRF EIS 1998; Ka'ula Archeological and Cultural Properties Study 2001). Targets are occasionally flown in by helicopter and dropped on the island. Chapter 7 (Hawaiian OPAREAS) of FACS FACSDINST 3120.1E lists the ordnance delivery pattern as a run-in heading of 270 degrees, left turn. Pilots are instructed to maintain an altitude above 2,000 feet due to bird activity in the vicinity of the targets. The Code of Federal Regulations (CFR) Section 33 §334.1340 Pacific Ocean, Hawaii, lists the danger zone and buffer area for aerial bombing and strafing targets associated with Ka'ula Rock as a circular area with a 3 mile radius from the center of the island.

The island supports a semi-arid and strand flora of low-growing shrubs and herbs. At least 25 plant species have been identified on the island. The endemic and indigenous species include alaeo, morning glory, Kakonakona grass, kukaipua'a, sanburr, 'ilima, nohu, popolo, ilieo, pualele, koko, purslane 'ihi, nene, maipilo, and milo. The introduced plant species are represented by a variety of grasses, weeds, and koa haole.

No permanent, fresh water sources are known to exist on the island. However, ephemeral streams fed by rainwater dissect both the windward (eastern) and leeward (western) sides of the island. The intermittent stream flows have eroded the island into V-shaped gullies that converge downstream on the windward side and diverge downstream on the leeward side. Rainwater flows across the steep volcanic rock surface of the range towards the Pacific Ocean which surrounds the range. There are no groundwater resources associated with Ka'ula Island.

The island is inhabited by a large population of sea birds consisting of at least 18 different species such as Albatross, Booby, Frigate Bird, Noddy, Petrel, shearwater, Tern and Tropic Bird. It also is a destination for migratory water birds and exotic land birds, such as finches, cardinals, mockingbirds, and rice birds.

Humpback Whales are an endangered species that transit the Hawaiian waters as part of their annual winter migration. They generally depart the waters in mid-May. They are classified as a federally protected species and it is illegal for any vessel to approach within 100 yards or any aircraft to operate within 1,000 feet of a Humpback Whale. The presence of Humpback Whales in the immediate exercise area during any training exercise prohibits all ordnance delivery at Ka'ula Rock. During the peak Humpback Whale season (November through May), 20-mm and 30-mm cannon fire are not authorized for use on the island except through waivers approved by CNRH.

A 1976 archeological study conducted by the State Parks Historic Sites Division of the DLNR, known today as the State Historic Preservation Division, identified four sites on the island. Two of the sites, a terraced platform (Hommon's Site 02) and two mounds (both mounds represent an archaeological site), were located on the north end of the island. The other two sites, a cave (Hommon's Site 01) and lighthouse foundation, were located near or on the summit at the center of the island. None of the four sites are located in the southern end of the island which is the designated ordnance target area.

A second archeological survey of the island was conducted in January 2001. That archeological survey identified a total of six archaeological sites. Three of the sites were identified in the 1976 survey described above. The fourth site from 1976 survey, Hommon's Site 01, was not found during the 2001

survey. The survey team noted that a portion of the cliff face was unstable with signs of a recent collapse due to erosion. They team surmised that the site was destroyed or buried in the process. The three new sites identified included two mounds and a cave shelter all located in the northern end of the island. There are no IRP sites on the island.

#### Ka'ula Rock ORSM: Assessment

Historical records and interviews indicate that inert munitions used during training would have been responsible for the deposition of the majority of residual explosives at Ka'ula Rock. Section 4.2.4.3 and Table 4-1 discusses the munitions expenditures and constituents profile data results for the Ka'ula Rock and the small quantities of small arms and air-delivered munitions used on annual basis on the range. No laboratory data exists to demonstrate transformation or transport of HMX, RDX, and TNT either on or off-site. Risk assessment indicates that human receptors are limited to range users and level of risk is acceptable for all range users.

Section 4.2.5 provides a summary of the ORSM results for Ka'ula Rock. Based on the small quantities of inert munitions used at the range on an annual basis and the low probability of exposure to human receptors to MCs in significant concentrations, no further analysis is required to assess risk of off-range release of MCs at the EOD Training Range. This decision, however, should be contingent upon the need to re-assess the pending review of migratory birds and range operations impact. This range will be re-evaluated when the RCA is repeated in five years.

#### ***PMRF Barking Sands***

The PMRF ORSM supports the Technical Team's assessment that the missile and rocket launch sites associated with PMRF are not a significant source of MCs and have not posed an unacceptable risk to public health and the environment. For these reasons and based upon RSEPA Policy Implementation Manual guidance (Rev. 1) (CNO, 2006) that Predictive Modeling is only necessary where live munitions are used, no further analyses was conducted for missile and rocket related testing in the PMRF area.

#### Operational

PMRF is operated by USPACOM and COMPACFLT Systems Commands to support critical sustainment training for the Navy, Army, Marine Corps, U.S. Coast Guard, Hawaii Air National Guard, and Department of Energy. This facility provides support services for fleet anti-submarine warfare (ASW), anti-surface warfare (ASUW), anti-air warfare (AAW), electronic combat (EC), command and control warfare (C2W), amphibious warfare (AMW), ballistic missile defense (BMD), and mine warfare (MIW). PMRF's research, development, test and evaluation (RDT&E) mission includes providing support for tactic development, and test and evaluation. PMRF operations include land area, scheduling, communications, weather observation, and target system. PMRF includes three land-based operational ranges (North Launcher, 50K / THAAD, and DOE KTF). The three ranges are addressed together Section 4.4 with individual ORSMs for each range provided.

The mission of the PMRF is to facilitate training, tactics development, and test & evaluations for air, surface, and sub-surface weapons system. PMRF provides range users with a full suite of instrument support including radar, telemetry, electronic warfare, target remote command & control, communications, target launching facilities, data display, data processing and target/weapon firing and recovery facilities. The focus of this assessment is limited to just the firing or launch areas themselves (North Launcher, 50K / THAAD, and DOE KTF) as there is no land-based impact areas associated with the facility on the island of Kauai. Rockets and missiles launched at the facility typically are designed to land in the water of the Pacific Ocean where they are recovered for post firing analysis.

The ROCC located at Barking Sands controls the launches conducted at the PMRF facility. All assets and equipment needed to support launches are available at PMRF. Full service launch support includes flight safety, explosive storage, tracking (radar and global positioning system [GPS]), telemetry, optical instrumentation, security, range control, and primary communications.

### 50K / THAAD Launch Area

According to PMRF Range Control personnel, the 50K Rail Launcher has been used to launch the ARAV missile system. Since 2000, four ARAV missiles have been launched from the two separate sites (pad 558 and 557) including one in FY04 and three in FY05. Only two liquid-fueled LANCE targets were launched from portable launchers dating to 2000 time frame. The range continues to be used to support various launches of rockets and missiles to support research and development for DoD and the MDA programs.

Launch pads are maintained and upgraded as needed to support the launches. No records of any environmental sampling, restoration activities, or responses were available. There are no UXO or explosives associated with the site as there are no land based impact areas associated with the PMRF on Kauai. The following is a description of the missile and rocket launches listed in the available expenditure records. According to PMRF Range Control personnel, only four launches have occurred since 2000 (one in FY 2004 and three in FY 2005) with the ARAV system. For the RCA, only the propellant loads are of concern since there are no land based impact areas associated with the PMRF. The ARAV system contains a solid-fueled rocket loaded with Aerojet M56 propellant. Aerojet M56 propellant contains nitrocellulose, nitroglycerin, and ammonium perchlorate. THAAD interceptors use a solid base propellant with the following major components: aluminum, ammonium perchlorate, and a binder. It is likely that of the propellant types of the solid rocket motors used in the ARAV and THAAD missiles, only perchlorate is likely to be considered a MC to be assessed under the RSEPA program. The majority (if not all) of the propellant from the launches is consumed during launch process. The 50K Rail Launcher is built upon a concrete and asphalt pad. The exhaust gas from the blast is directed onto this area. The major exhaust components of THAAD missiles include aluminum oxide, carbon dioxide, carbon monoxide, hydrogen, hydrogen chloride, nitrogen, and water.

There are no plans to change the current use of the 50K Rail Launcher and THAAD Launcher areas associated with PMRF.

### Land Use

PMRF is owned by the Navy and is used to support various rocket and missile launches in support of Navy operations and the ballistic missile defense program. The dominant land use on PMRF is for operational missile and rocket launches, and includes the ESQD arc and airfield clear zones which cover the installation.

The public does not have access to or use of the launch areas associated with PMRF. The surrounding waters within the 100-fathom contour (Class A) are designated as protected for primarily recreational use and aesthetic enjoyment. However, civilian access to these areas within a 10,000-foot radius of the launch point (including beaches, surrounding waters) is restricted during a launch.

### Environmental

PMRF Barking Sands has a generally flat topography with a nominal elevation of 15 feet above mean sea level. Low beach barrier dunes, mildly undulating blanket sands, and the more prominent Nohili Dunes located at the northern end of the base form local relief. The Nohili Dunes form the highest elevation point on the base, rising to approximately 100 feet above mean sea level. The launch areas of concern are

flat. The area around the launch sites contains low-lying grasses characterized as ruderal vegetation and are maintained through periodic mowing. Taller vegetation is prevented from becoming established within the launch areas.

The Hawaii State Department of Health (DOH) classifies the waters adjacent to Barking Sands bounded by the 100-fathom (183-meter) contour as Class A. As such, they are designated as protected for primarily recreational use and aesthetic enjoyment. Class A waters may be used for other purposes that comply with the protection and propagation of fish, shellfish, and wildlife, and with marine recreation. Furthermore, these waters are restricted in terms of discharge, in that industrial or commercial effluent must receive the best degree of treatment.

An Environmental Impact Statement (EIS) Report completed for the PMRF area in December 1998 quoted a U.S. Army Program Executive Office sponsored study that provided some pertinent information regarding the surface water at PMRF. According to the study referenced in the EIS, “surface water within the PMRF boundary is in the canals that drain the agricultural areas east of the PMRF. Apart from these drainages, the rain sinks into the permeable sand so that no surface drainage has been established.” The canal in closest proximity to the launchers is the Nohili Ditch, approximately 475 feet south of the THAAD launcher.

Surface runoff is generated when precipitation falls on impervious surfaces such as the concrete launch pads. The runoff, however, leaving the pads is generally limited by the porous nature of the soils. According to the EIS Report completed in December 1998, potable water comes from two sources: the Kauai Board of Water Supply and Amfac Sugar-Kauai. The total average consumption of Kauai County water by PMRF facilities was approximately 193,699 liters (L) (51,170 gal) per day (based upon 1996 data). The potable water from the Kauai Board of Water Supply water comes from high level water tunnels above the Mana Plain.

In addition, according to the EIS, the dune sand aquifer on which PMRF/Main Base lies has a moderate hydraulic conductivity and moderate porosity of about 20 percent with highly permeable bedrock layer of basement volcanics, primarily basalt. The area contains a lens of brackish groundwater that floats on seawater that is recharged by rainfall and by seepage from the underlying sediments. The only record of an attempt to exploit this groundwater is of a well drilled for the Navy in 1974, 6.4 to 8 kilometers (4 to 5 mi) south of KTF. The well was drilled to a depth of 12.8 meters (42 ft), and tested at 1,135.6 L per minute (300 gal per minute). In 1992, the water was too brackish for plants and animals to consume, and consequently, the well is not used. The nearest fresh groundwater sources are in the Napali formation at the inland edge of the coastal plain along the base of the Mana cliffs. Environmental personnel at PMRF indicated that groundwater is physically dewatered from the Mana Plain region via pumping which draws down the groundwater to a level approximately two to three feet below mean sea level.

Four ecosystems are found at Barking Sands: altered and natural wetlands, coastal beach, high dune, and near shore marine. The undeveloped terrestrial portions of the base are dominated by introduced scrub vegetation. No T&E plant species are known on the site. The ditches around and across PMRF Barking Sands provide wetland habitat for four endemic, federally listed endangered water birds: Hawaiian coot (*Fulica alai*), common moorhen (*Gallinula chloropus*), black-necked stilt (*Himantopus mexicanus knudseni*), and Hawaiian duck (*Anas wyvilliana*). According to the INRMP, the area of the 50K Rail Launcher and the THAAD Launcher are considered to be areas that may be subject to nesting by the Laysan albatross (*Phoebastria immutabilis*), a migratory seabird (shown in Figure 4-16). The Laysan Albatross is not a listed T&E species, but is protected under the Migratory Bird Treaty Act of 1918.

Cultural resource studies have identified a total of 66 historic properties at Barking Sands, including 18 pre-Contact Native Hawaiian sites, 44 military sites, two historic sites, and one site where Native

Hawaiian human remains have been re-interred. All of the pre-Contact sites and 19 of the historic military sites are considered eligible for the NRHP. Most of these sites are located within the coastal dunes, which is considered an area of high archaeological sensitivity both because of the known buried cultural deposits and Native Hawaiian human remains, and because of the potential for encountering additional subsurface resources in the future. Architectural studies have also identified four World War II-era buildings that are considered eligible for the NRHP and 11 structures built after World War II that will need to be evaluated for eligibility as possible Cold War-era historic properties. A map showing the specific locations of the footprint of these cultural sites were not available to the Technical Team therefore their proximity to the 50K and THAAD launch areas is unknown. However, installation personnel indicate that none of the cultural sites are located in or near the 50K and THAAD launch areas.

Four IRP sites are present at the PMRF facility; however, none are located in or near the 50K and THAAD launch areas.

#### 50K / THADD Launch Area ORSM: Assessment

Historical records and interviews indicate that missiles and rockets used during training would have been responsible for the deposition of the majority of residual explosives at PMRF. Section 4.3.3.8 discusses the munitions expenditures and constituents profile data results for the THADD / 50K Launch Area and the four missile and rocket launches that have occurred since 2000 on the range. No laboratory data exists to demonstrate transformation or transport of HMX, RDX, and TNT either on or off-site. Risk assessment indicates that human receptors are limited to range users and level of risk is acceptable for all range users.

Section 4.3.3.12 provides a summary of the ORSM results for 50K/THADD Launch Area. Based on the only four missile and rocket launches since 2000 at the range and the low probability of exposure to human receptors to MCs in significant concentrations, no further analysis is required to assess risk of off-range release of MCs at the 50K/THADD Launch Area.. This range will be re-evaluated when the RCA is repeated in five years.

#### North Launcher

The North Launcher Area contains several launch pads and sites which are commonly referred to by a number. The following pads and sites are within the North Launcher Area: 566, 567, 568, 569, 570, 571, 572, 577, 580, 582, 583, 584, 588, and 589. The launchers are configured close to each other as shown in Figure 4-18. There are various types and configurations of launchers based upon the type of missiles being launched. The Vandal launcher is shown in Figure 4-19 below. The launchers themselves are permanently mounted structures that have various degrees of freedom in terms of angle and direction to accommodate a wide variety of mission driven trajectories. Typical launches have trajectories firing westerly towards the open ocean.

Launch pads are maintained and upgraded as needed to support the launches. No records of any environmental sampling, restoration activities, or responses were available. There are no UXO or explosives associated with the site as there are no land based impact areas associated with the PMRF on Kauai. The following is a description of the missile and rocket launches listed in the available expenditure records. PMRF Range Control personnel provided launch data dating back to year 2000 for the PMRF area along with the missile / target systems used on the PMRF facility (listed above). Expenditure data was provided for three out of the five missile / target systems that PMRF Range Control personnel associated with the North Launcher Area. Data for years 2000-2005 were provided to the Technical Team. The summation of the number of launches for each of the three missile / target systems that data was provided for is listed below.

- BQM-34 - 23 launches total
- BQM-74 - 227 launches total
- Terrier - 2 launches total

For the purposes of this assessment it is assumed that all of the launches listed above originated from the North Launcher Area. For the RCA, only the propellant loads are of concern since there are no land based impact areas associated with the PMRF. The BQM-34 and BQM-74 systems use jet propulsion engines which run off of JP3, 4, 5 and 8 fuels so they do not contain any of the RSEPA indicators MC. However, when the BQM-34 and BQM-74 systems are surface launched, two Jato rocket bottles are used to help boost the rocket into the air. Once the Jato rockets are expended, they typically drop off and the rocket continues along its designated path under the jet engine. Examples of Jato rocket bottles include the Mk23 Mod1 which has a NEW of (144 lbs) 74% of which (i.e. 106.56 lbs) is perchlorate and the Mk6 Mod 1 which has a NEW of 72lbs of which 75% (i.e. 54 lbs) is perchlorate. The Terrier Rocket motor system contains 1,226 lbs of double based nitroglycerin / nitrocellulose propellant.

There are no plans to change the current use of the North Launcher area associated with PMRF.

#### Land Use

Refer to the land use description in the 50K / THADD launch area section noted above. .

#### Environmental

Refer to the environmental description in the 50K / THADD launch area section noted above. The North Launcher itself is relatively flat across the area.

No vegetation is present within the launch areas as an impervious concrete floor is present on the launch area. By explosives safety requirements, the area around the individual launch sites and pads must be clear of vegetation. Minimum distances range from 50 to 100 ft depending upon the type of missile / target system launched. Vegetation surrounding the launch pads is characterized as Pohinahina-Naupaka Dune Vegetation. This community contains Pohinahina (*Vitex rotundifolia*); a woody, branching, sprawling shrub that forms low mats 1 to 3 feet tall. Akoko (*Chamaesyce celastroides*), a succulent shrub belonging to the spurge family with milky sap, is locally abundant, especially in the area of the launch pads. Scattered, low thickets of naupaka (*Scaevola sericea*); 2 to 4 feet tall are also present. Overall, the vegetation is limited to low-lying grasses and shrubs between the beach and the launch areas. Medium-sized bushes, shrubs, and trees are present behind the launch area.

Critical habitat for the endangered Lau'ehu (*Panicum niihauense*) is present along the dunes on the northwest end of PMRF and surrounds the North Launch Area. The 1998 EIS concluded that vegetation near the launch pad could have some temporary distress from the heat generated at launch and from hydrogen chloride emissions. However, there was no evidence of any long-term adverse effect on vegetation from two decades of launches at PMRF.

Nesting sites for the migratory Wedge-tailed shearwater, which is protected under the Migratory Bird Treaty Act of 1918, are located to the south of the North Launch Area. However, effects of launches on wildlife, including noise and/or heat effects, were considered to be minimal in the EIS. In addition, the threatened Newell's Townsend's shearwater (*Puffinus auricularis newelli*) may fly over the North Launch Area at night. The 1998 EIS indicated that lighting systems used during missile and target launches from PMRF may disorient the shearwater, but that shielded lighting systems would minimize these impacts.

Installation personnel indicate that no shielded lighting systems have been established; however, night launches at this location are considered rare.

The ICRMP also indicated that launch activities, including launch pad mishaps, accidental launch vehicle ground strike, construction or launch vibration, ignition of vegetation from missile exhaust or debris and subsequent fire suppression activities may disturb this and other archaeological sites at PMRF. Mitigation measures to protect these sites include:

- Spray water on vegetation around launch sites prior to launches to prevent ignition; and
- Survey by professional archaeologist subsequent to unexpected fires, launch pad mishaps, accidental launch vehicle ground strikes to determine and/or evaluate damage; recommendations to mitigate adverse impacts from future launch-related activities should be made.

According to PMRF personnel, water spraying mitigation measures have been enacted at the KTF launch area and presumably can be applied at the North Launch Area in the event of a mishap, as helicopters with water buckets are airborne during launches at PMRF. There have been no archaeological surveys conducted as a result of launch accidents at PMRF since the ICRMP was released.

Four IRP sites are present at the PMRF facility; however, none are located in the North Launcher Area.

#### North Launcher Area ORSM: Assessment

Historical records and interviews indicate that missiles and rockets used during training would have been responsible for the deposition of the majority of residual explosives at PMRF. Section 4.3.4.4 discusses the munitions expenditures and constituents profile data results for the North Launcher Area and the 252 missile and rocket launches that have occurred since 2000 on the range. No laboratory data exists to demonstrate transformation or transport of HMX, RDX, and TNT either on or off-site. Risk assessment indicates that human receptors are limited to range users and level of risk is acceptable for all range users.

Section 4.3.4.8 provides a summary of the ORSM results for North Launcher Area. Based on the 252 missile and rocket launches since 2000 at the range and the low probability of exposure to human receptors to MCs in significant concentrations, no further analysis is required to assess risk of off-range release of MCs at the North Launcher Area.. This range will be re-evaluated when the RCA is repeated in five years.

#### DOE KTF

The KTF is a DOE facility that is operated by Sandia National Laboratories (SNL). KTF is a fully integrated tenant on the PMRF. The launch pads at KTF are designed to launch missiles and rockets to provide live fire tests of the various systems including but not limited to the guidance and control systems, payload systems, tracking systems, and telemetry systems. The KTF is depicted on Figure 4-22.

The 120-acre launch field contains two rail-guided 7.5K launchers, two rail-guided 20K launchers (with removable controlled environmental shelters), one STARS launch pad (with removable environmentally controlled Missile Service Tower), a decontamination facility for liquid hypergolic fuel and oxidizer (and covered holding pads for each), STARS missile assembly building, two small rocket assembly buildings, and a Rocket Motor Staging Area (RMSA) that doubles as an assembly area for larger motors. The Kokole Pt. Launcher, located at the south end of PMRF, supports a 7.5K launcher.

Launch pads are maintained and upgraded as needed to support the launches. No records of any environmental sampling, restoration activities, or responses were available. There are no UXO or

explosives associated with the site as there are no land based impact areas associated with the KTF on Kauai. The following is a description of the missile and rocket launches listed in the available expenditure records.

The KTF dates back to 1961. Between 1961 and 1962, KTF served as a research and development facility to perform diagnostic tests on high altitude nuclear missile tests conducted on Johnston Island. In that time frame a total of 68 launches were performed at the KTF. From 1963 to 1966 the site was retrofitted to support readiness flight systems development. During those four years, 115 launches occurred. From 1967-1975, the primary mission of the KTF was to support technology development and scientific applications for the Test Readiness Program. During those nine years, a total of 136 launches occurred. From 1976-1981, KTF supported technology development and scientific applications for the DoE, the National Aeronautics and Space Administration (NASA), and DoD. During those six years, a total of 14 launches occurred. From 1982-2001, KTF supported the STARS Program and the Theater Missile Defense Program. During that time period, a total of 51 launches occurred.

Since 2001, only seven missile launches have been conducted at the site (one in 2001, three in 2002, two in 2003, and one in 2005). All seven launches involved the Minuteman Rocket with the M56 Rocket System in support of the MDA Space and Missile Defense Command (SMDC). The launches were in support of the Aegis system which is designed to be a forward deployed, sea-based, midcourse missile defense system. The launches to date marked the completion of the Navy Aegis Lightweight Exo-Atmospheric Projectile (LEAP) Intercept (ALI) Flight Demonstration Project. ALI consisted of a series of near-term flight tests with the primary objective of demonstrating that LEAP technologies can be integrated with a modified Standard Missile-3 (SM-3) to successfully hit a target ballistic missile in the exo-atmosphere. This was demonstrated by two successful flight test intercepts, Flight Mission (FM)-2 in January 2002 and FM-3 in June 2002 both conducted at the KTF. The Aegis MDA program completed capability flight-testing launches FM-4 through FM-7, at the KTF. At least two more launches FM-8 and FM-9 are scheduled to be conducted at KTF in the future.

For the purposes of this assessment it is assumed that all of the launches listed above originated from the KTF Area. Since the KTF was constructed, a total of 384 launches were conducted at the facility. The types of rocket and missile system launched at the site are described above. For the RCA, only the propellant loads are of concern since there are no land based impact areas associated with the KTF. The propellant types and weights for each of the various rocket and missile system launched at the KTF are summarized in Table 4-6.2. Of the propellant types listed in Table 4-6.2, only perchlorate (a component of solid rocket motor propellants) is considered a MC to be assessed under the RSEPA program.

There are no plans to change the current use of the KTF area associated with PMRF.

#### Land Use

Refer to the land use description in the 50K / THADD launch area section noted above. . .

#### Environmental

Refer to the environmental description in the 50K / THADD launch area section noted above. The undeveloped terrestrial portions of the PMRF Barking Sands Facility are dominated by introduced scrub vegetation. Native vegetation is found on the large Nohili Dunes in the northern part of the base.

There are numerous drains and several irrigation ponds in the agricultural land located adjacent to the north of PMRF. The waters in the irrigation ponds generally do not meet drinking water standards for chloride salts, but have near neutral to slightly alkaline pH.

A surface water quality study for chloride was conducted in the Mana Plain/KTF area. The chloride levels do not indicate residual hydrochloric acid effects of the past launches at KTF (U.S. Army Program Executive Office, 1995, May, p.3-20). The water in the southern half of PMRF/Main Base is expected to have similar chemical characteristics. Because the drainage ditches are designed to move water away from the agricultural fields during irrigation and rainfall, and to leach salts from the soil, no residual effects of past launches are expected (U.S. Army Program Executive Office, 1995, May, p.3-20). Water quality along the PMRF shoreline was within DOH standards with the exception of two locations where sugar cane irrigation water, pumped from the sugar cane fields, is discharged to the ocean (Belt Collins Hawaii, 1994). In these areas, DOH water quality criteria are exceeded within 50 m (164 ft) of the shoreline. Mixing processes are sufficient to dilute the drainage water to near background levels within 50 to 100 m (164 to 328 ft) from the shoreline (Belt Collins Hawaii, 1994, 23 July, p.1 through 26).

According to the EIS Report completed in December 1998, "at PMRF, potable water comes from the Kauai Board of Water Supply and Amfac Sugar-Kauai, who treat it." Total average consumption of Kauai County water by PMRF facilities in 1996 was approximately 193,699 liters (L) (51,170 gal) per day for the period from 19 July through 19 September 1996. Usage from this source is typically less than one-third of the quantity received from Amfac Sugar-Kauai. The maximum daily delivery capacity of water from the Amfac Sugar-Kauai is 1,090,195 L (288,000 gal) per day. The amount of water provided to PMRF from the county is limited to 310,403 L (82,000 gal) per day (Hiroaka Hironaka, 1997, 13 Jan, p.1). Kauai Board of Water Supply water comes from high level water tunnels above the Mana Plain.

Bedrock, alluvium, and sand dunes make up hydraulically connected aquifers within the region of influence. The bedrock (basement volcanics, primarily basalt) is highly permeable, containing brackish water that floats on seawater (U.S. Army Space and Strategic Defense Command, 1993, Oct, p.3-7). The dune sand aquifer on which PMRF/Main Base lies has a moderate hydraulic conductivity and moderate porosity of about 20 percent. It consists of a lens of brackish groundwater that floats on seawater and is recharged by rainfall and by seepage from the underlying sediments. The only record of an attempt to exploit this groundwater is of a well drilled for the Navy in 1974, 6.4 to 8 kilometers (4 to 5 mi) south of KTF. The well was drilled to a depth of 12.8 meters (42 ft), and tested at 1,135.6 L per minute (300 gal per minute). In 1992, the water was too brackish for plants and animals to consume, and consequently, the well is not used (U.S. Army Program Executive Office, 1995, May, p.3-20). The nearest fresh groundwater sources are in the Napali formation at the inland edge of the coastal plain along the base of the Mana cliffs. Groundwater in the region is generally considered to be potable at the base of the cliffs, increasing in salinity closer to the coast."

Four ecosystems are found at the PMRF Barking Sands: altered and natural wetlands, coastal beach, high dune, and near-shore marine. According to the Integrated Natural Resource Management Plan (INRMP), two of the KTF launch pads lie within the high dune ecosystem. No threatened or endangered plant species are known on the PMRF Barking Sands site.

Architectural studies have also identified four World War II-era buildings that are considered eligible for the NRHP and 11 structures built after World War II that will need to be evaluated for eligibility as possible Cold War-era historic properties. A map showing the specific locations of the footprint of these cultural sites were not available to the Technical Team therefore their proximity to the KTF launch pads is unknown. However, installation personnel indicate that none of the cultural sites are located in or near the KTF launch areas.

"According to PMRF personnel, water spraying mitigation measures have been enacted at the KTF launch area, as previously described in the North Launch Area ORSM."

Four IRP sites are present at the PMRF facility; however, none are located in the area of the KTF launch pads.

#### KTF ORSM: Assessment

Historical records and interviews indicate that missiles and rockets used during training would have been responsible for the deposition of the majority of residual explosives at PMRF. Section 4.3.5.4 discusses the munitions expenditures and constituents profile data results for the KTF Area and the 384 missile and rocket launches that have occurred since 1961 on the range. No laboratory data exists to demonstrate transformation or transport of HMX, RDX, and TNT either on or off-site. Risk assessment indicates that human receptors are limited to range users and level of risk is acceptable for all range users.

Section 4.3.5.8 provides a summary of the ORSM results for KTF Area. Based on the 384 missile and rocket launches since 1961 (only seven missile launches since 2001) at the range and the low probability of exposure to human receptors to MCs in significant concentrations, no further analysis is required to assess risk of off-range release of MCs at the KTF Area.. This range will be re-evaluated when the RCA is repeated in five years.

### **DECISION POINT 1**

#### ***Are Further Steps Required to Maintain Compliance?***

Findings from Interviews and Records Review

Records review and interviews with environmental compliance managers and range personnel at West Loch EOD, Ka'ula Rock, and three ranges (North Launcher, THAAD/50K, and DOE KTF) at PMRF indicate that installation environmental programs are in compliance with U.S. Navy environmental program requirements and are; therefore, considered to be in compliance with Federal environmental regulatory requirements. No further steps are required to maintain environmental compliance of the Hawaii Land-Based Operational Range Complex. Some areas have been identified that could enhance compliance with U.S. Navy range management requirements.

#### ***Recommendations / Protective Measures Plan***

The following measures are recommended to enhance compliance of the Hawaii Range Complex area with the requirements specified in DoDD 4715.11:

##### **Maintaining Range Records**

- Document duds of munitions used within the Hawaii Range Complex that illuminate or have live motors, such as flares, rockets or missiles.
- Begin tracking ordnance use within Ka'ula Rock, including but not limited to the use of inert or practice munitions.
- Establish a permanent record of all UXO clearance activities.
- Conduct UXO surveys at the West Loch EOD shoreline on a periodic basis for UXO exposed due to shoreline erosion or other natural causes.

##### **Range Access**

- Establish procedures to determine which Hawaii Range Complex visitors require an escort.
- Prepare a training aide that includes photographs and/or video clips of the potential UXO hazards for authorized visitors to the Hawaii Range Complex.

- Add UXO hazard labels to the No Trespassing signs at PMRF area beach to alert the public to the explosive hazards of trespassing onto the ranges.

#### **UXO Hazard Education**

- Implement a proactive education program to alert personnel of the potential UXO hazards at the PMRF Beach area adjacent to the PMRF launch area.

#### **Environmental Impacts**

- Use established ATR procedures for assessing the potential environmental impacts associated with future aerial target, rocket or missile launches from the PMRF launch areas.

### ***Is Further Analysis Required to Assess Risk of Potential Off-Range Release?***

#### **Findings from Munitions Data and ORSM**

##### **West Loch EOD Data and ORSM Findings**

The Technical Team's assessment is that the EOD live munitions-related activities conducted at the West Loch EOD are not a significant source of MCs. In addition, due to the brackish aquifers underlying the West Loch EOD, the Technical Team concludes that West Loch EOD munitions-related operations have not posed an unacceptable risk to public health or the environment. No further analysis is required to assess the risk of an off-range release of MCs at the West Loch EOD area. The range should be re-evaluated when the RCA is repeated in 5 years.

##### **Ka'ula Rock Data and ORSM Findings**

The Technical Team's assessment is that the inert or practice munitions-related activities conducted at the Ka'ula Rock are not a significant source of MCs. ORSM found no MC related pathway / receptor interactions associated with Ka'ula Rock. The Technical Team concludes that Ka'ula Rock munitions-related operations have not posed an unacceptable risk to public health or the environment and no further analysis is required to assess the risk of an off-range release of MCs at the range from past munitions-related operations. The Technical Team recommends that the range be re-evaluated with a RCA in another 5 years.

##### **PMRF Data and ORSM Findings**

The PMRF ORSM focused on the potential deposition of MCs at three launch areas (North Launcher, THAAD/50K, and DOE KTF) from past missile and rocket launch related operations. Based upon historical records and interviews, it was determined that perchlorate originating from propellant used in solid rocket motors was the likely MC for RSEPA program. The RCA found that the majority (if not all) all propellant from the launches was consumed during the launch process which was supported from concrete and asphalt pads. The range should be re-evaluated when the RCA is repeated in 5 years.

##### **THADD / 50K**

Based upon the Technical Team's assessment, the THADD / 50K launch area and missile / rocket launch-related operation were not a significant source of MCs and does not pose an unacceptable risk to public health or the environment. No further analysis is required to assess the risk of an off-range release of MCs at the THADD / 50K launch area.

##### **North Launcher**

Since perchlorate was the only MC derived from the missile and rocket launches, the Technical Team concluded that the North Launcher area does not pose an unacceptable risk to public health or the environment. No further analysis is required to assess the risk of an off-range release of MCs at the North Launcher area.

**DOE KTF**

Based upon the Technical Team's assessment, the DOE KTF launch area and missile / rocket launch-related operation were not a significant source of MCs and does not pose an unacceptable risk to public health or the environment. No further analysis is required to assess the risk of an off-range release of MCs at the DOE KTF launch area.