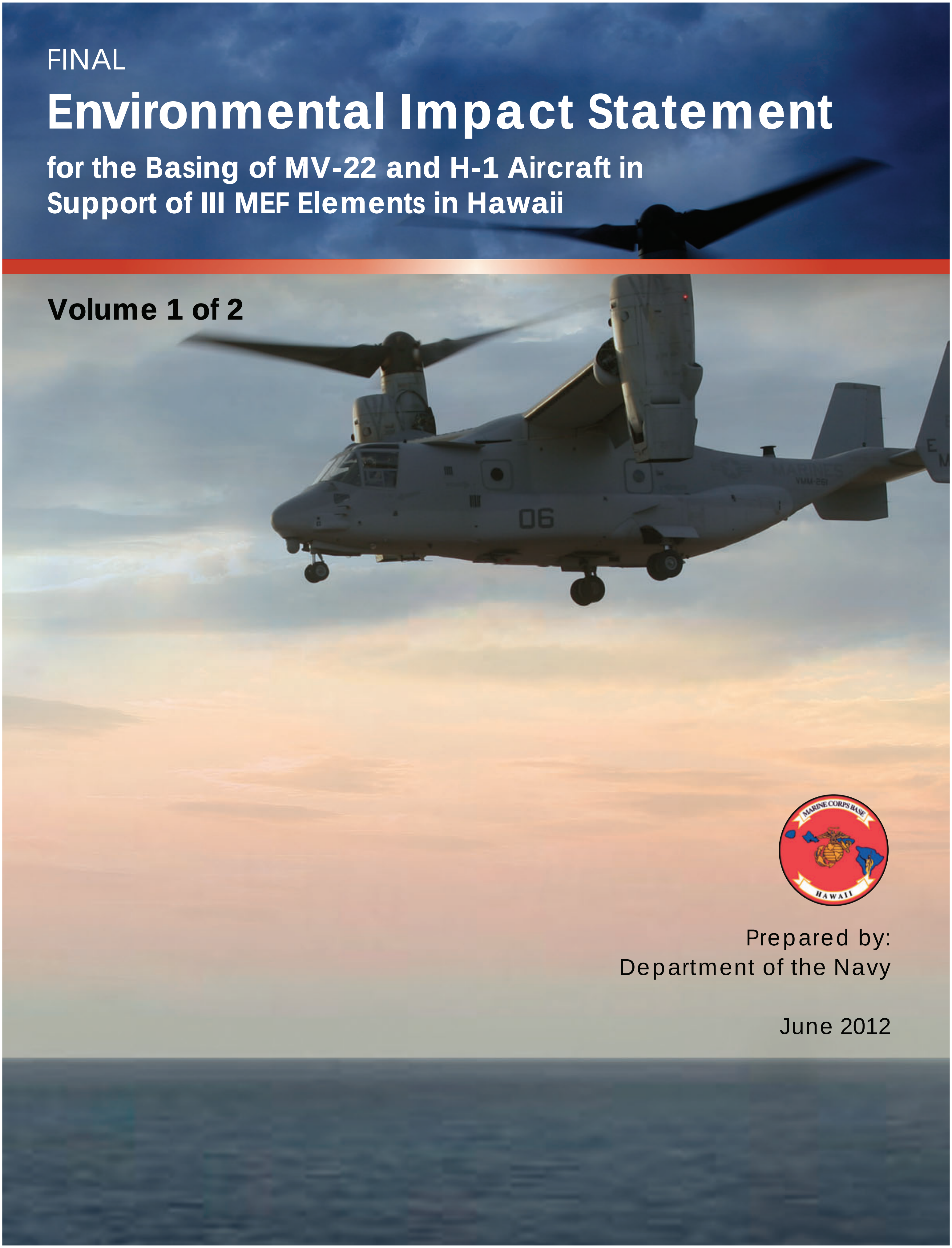
FINAL

Environmental Impact Statement

for the Basing of MV-22 and H-1 Aircraft in Support of III MEF Elements in Hawaii

Volume 1 of 2



Prepared by:
Department of the Navy

June 2012

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR BASING OF MV-22 AND H-1 AIRCRAFT IN SUPPORT OF
III MARINE EXPEDITIONARY FORCE (MEF) ELEMENTS IN HAWAII
June 2012

Lead Agency for the EIS:	Department of the Navy
Cooperating Agency:	Department of the Army
Title of Proposed Action:	Basing of MV-22 and H-1 Aircraft in Support of III MEF Elements in Hawaii
Designation:	Final EIS

ABSTRACT

This Environmental Impact Statement (EIS) has been prepared by the Department of the Navy in accordance with the National Environmental Policy Act of 1969 (NEPA), 42 United States Code (U.S.C.) §4321-4374, as implemented by the Council on Environmental Quality (CEQ) regulations, 40 Code of Federal Regulations (CFR) §§1500-1508; *DoN Procedures for Implementing NEPA* (32 CFR §775); Marine Corps Order 5090.2A (with Changes 1, 2); and the *Marine Corps Environmental Compliance and Protection Manual,* Chapter 12. The proposed action addressed in this EIS would include: (1) basing and operation of up to two Marine Medium Tiltrotor (VMM) squadrons (24 aircraft) and one Marine Light Attack Helicopter (HMLA) squadron (27 aircraft) in Hawaii; (2) construction and renovation of facilities to accommodate and maintain the squadrons; and (3) conducting aviation training, readiness, and special exercise operations at training areas statewide. As a result of a systematic analysis to identify possible basing locations, only Marine Corps Base (MCB) Hawaii Kaneohe Bay met all requirements, and the alternatives evaluated in this EIS are facility siting alternatives at that installation. In Alternative A, all aviation facilities would be on the south side of the runway. In Alternative B, VMM facilities would be located on the northwest side of the runway at West Field, and would include construction of a runway underpass for access. New bachelor enlisted quarters (BEQ) would also differ between the two action alternatives. Aviation training activities associated with each action alternative would be identical. Approximately 1,000 active duty personnel, 22 civilian personnel, and 1,106 dependents would be associated with the VMM and HMLA squadrons. With the No Action Alternative, the squadrons would not be based in Hawaii, and no facilities would be constructed at MCB Hawaii Kaneohe Bay or any of the other training areas to support them. This EIS presents an analysis of potential environmental impacts on the following resources: land use (land use compatibility, quality of the built environment, land ownership, public access); airspace; air quality; noise; geology, soils, and topography; drainage, hydrology, and water quality; biological resources; cultural resources; safety and environmental health (natural hazards, hazardous materials/waste, airfield safety, aircraft safety, bird aircraft strike hazard, wildland fires, ordnance safety); socioeconomics; environmental justice and protection of children; infrastructure (roadways and traffic, public transit, potable water, wastewater, solid waste, electrical, telephone and cable); and energy use. The Notice of Intent (NOI) to prepare an EIS was published in the *Federal Register* on August 6, 2010. The Notice of Availability (NOA) of the Draft EIS was published in the *Federal Register* on November 10, 2011.

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Acronyms and Abbreviations

AAQS	Ambient Air Quality Standards
ac	acre
ACE	Aviation Combat Element
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADC	Agribusiness Development Corporation
AFS	Air Force Station
AFFF	Aqueous Fire Foam Film
AGL	above ground level
AICUZ	Air Installation Compatibility Use Zone
AIRFA	American Indian Religious Freedom Act
ANTTP	Air Naval Tactics, Techniques, and Procedures
APE	area of potential effect
APHIS WS	Animal and Plant Health Inspection Services Wildlife Services, U.S Department of Agriculture
API	Agriculture Preservation Initiative
APZ	Accident potential zone
ARPA	Archeological Resource Protection Act
ARTCC	Air Route Traffic Control Center
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
AST	Aboveground storage tank
ASW	anti-surface warfare
AT/FP	Antiterrorism/Force Protection
ATBN	Antiterrorism Battalion
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
AvPlan	FY2011 Marine Aviation Plan
BAAF	Bradshaw Army Airfield
BAH	Basic Allowance for Housing
BARTSUR	Barking Sands Tactical Underwater Range
BASH	Bird Aircraft Strike Hazard
BE	Biological Evaluation

BEQ	Bachelor Enlisted Quarters
BFR	Basic Facility Requirement
BHWAS	Base Hazardous Waste Accumulation Site
BMP	Best Management Practices
BWS	Board of Water Supply, City and County of Honolulu
C&D	construction and demolition
CAB	Combat Aviation Brigade
CACTF	Combined Arms Collective Training Facility
CAL	confined area landing
CALA	Combat Aircraft Loading Area
CAS	Close Air Support
CDC	Child Development Center
CDP	Census Designated Place
CE	Command Element
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CFR	Code of Federal Regulations
CI	Coconut Island
CIF	Consolidate Issue Facility
CISD	Communications and Information Systems Department
City	City and County of Honolulu
CLB-3	Combat Logistics Battalion
cm	centimeter(s)
CM	cubic meters
CNO	Chief of Naval Operations
CO	Carbon monoxide
CPRW-2	Commander Patrol Reconnaissance Wing 2
CT	Census Tract
CY	calendar year
CY	cubic yards
CZM	Coastal Zone Management
dB	decibel

dBA	A-weighted sound level (dB)
DBEDT	Department of Business, Economic Development and Tourism (State of Hawaii)
DCA	Deputy Commandant for Aviation
DDESB	Department of Defense Explosives Safety Board
Det	Detachment
DGP	Department of General Planning (City and County of Honolulu)
DHHL	Department of Hawaiian Home Lands (State of Hawaii)
DLA	Defense Logistics Agency
DLNR	Department of Land and Natural Resources (State of Hawaii)
DMR	Dillingham Military Reservation
DNL	Day-Night Average Sound Level
DOD	U.S. Department of Defense
DOE	Department of Education (State of Hawaii)
DOH	Department of Health (State of Hawaii)
DoN	Department of the Navy
DOT	Department of Transportation (State of Hawaii)
DRMO	Defense Reutilization and Marketing Office
DU	depleted uranium
DZ	drop zone
ECPD	Environmental Compliance and Protection Department
ECPSOP	Environmental Compliance and Protection Standard Operating Procedures
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EMF	electromagnetic fields
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPACT	Energy Policy Act
ESQD	Explosive Safety Quantity Distance
ESA	Endangered Species Act
EUL	Enhanced Use Lease
EXT	external
FAA	Federal Aviation Administration

FAC(A)	Forward Air Controller (Airborne)
FACSFAC	Fleet Area Control and Surveillance Facility
FARP	Forward Arming and Refueling Point
FCLP	field carrier landing practice
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FIFRA	Insecticide, Fungicide, and Rodenticide Act
FIRM	Flood Insurance Rate Map
FR	Federal Register
ft	feet
FUDS	Formerly Used Defense Site
FY	fiscal year
GA	General Aviation
GCA	Ground Control Approach
GCE	Ground Combat Element
GHA	Ground Hazard Area
GHG	greenhouse gas
GSE	ground support equipment
GTF	Grow the Force
GWP	global warming potential
ha	hectare
HAMET	High-Altitude Mountainous Environmental Training
HAR	Hawaii Administrative Rule
HAZMIN	Hazardous Minimization
HC&S	Hawaiian Commercial and Sugar Company
HCEI	Hawaii Clean Energy Initiative
HCF	Honolulu Control Facility
HCM	Highway Capacity Manual
HECO	Hawaiian Electric Company
HHF	Historic Hawaiian Foundation
HIANG	Hawaii Air National Guard
HIARNG	Hawaii Army National Guard
HIREP	Hawaii Interisland Renewable Energy Program

HMH	Marine Heavy Helicopter (squadron)
HMLA	Marine Light Attack Helicopter (squadron)
HQ	headquarters
HQBN	Headquarters Battalion
HRC	Hawaii Range Complex
HSL-37	Helicopter Anti-Submarine Squadron Light 37
HSTT	Hawaii-Southern California Training and Testing
HW	hazardous waste
HWMP	Hazardous Waste Management Plan
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
IAS	Initial Assessment Study
IBC	International Building Code
IFR	Instrument Flight Rules
IMF	Intermediate Maintenance Facility
in	inch(es)
INRMP	Integrated Natural Resources Management Plan
IPBA	Infantry Platoon Battle Area
IRP	Installation Restoration Program
IWFMP	Integrated Wildland Fire Management Plan
JBPHH	Joint Base Pearl Harbor-Hickam
JCS	Joint Chiefs of Staff
JP	jet propellant
KH	Kamehameha Highway
KIAS	knots indicated air speed
KK	Kokokahi facility
KLOA	Kawailoa Training Area
km	kilometer(s)
KP	Kealohi Point
kph	kilometer(s) per hour
KTA	Kahuku Training Area
kV	kilovolt
LAT	low altitude training

LCA	Land Commission awards
LCE	Logistics Combat Element
LEED	Leadership in Energy and Environmental Design
LHA	Landing Helicopter Assault
LID	Low Impact Development
Lmax	Maximum Sound Level
LOS	level of service
LP	landing point
LR	Lilipuna Road
LZ	landing zone
m	meter(s)
MACS	Marine Corps Air Control Squadron
MAG-24	Marine Aviation Group 24
MAGTF	Marine Air Ground Task Force
MALS-24	Marine Aviation Logistics Squadron 24
MARFORPAC	Marine Forces Pacific
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCB	Marine Corps Base(s)
MCCS	Marine Corps Community Services
MCO	Marine Corps Order
MCTAB	Marine Corps Training Area Bellows
MCX	Marine Corps Exchange
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
mg	Million gallon(s)
mg/l	milligrams per liter
mgd	million gallons per day
MHPI	Military Housing Privatization Initiative
mi	miles
MILCON	Military Construction
MILS	Missile Impact Location System

MMF	Mobile Maintenance Facility
$MMTCO_2Eq$	million metric tons of carbon dioxide equivalent
MOU	Memorandum of Understanding
MOUT	Military Operations in Urban Terrain
msl	mean sea level
MSW	municipal solid waste
MTA	Molokai Training Area
MTSF	Molokai Training Support Facility
MW	megawatt(s)
MWSD	Marine Wing Support Detachment
MVA	Megavolt amperes
n.d.	no date
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	Naval Air Station
NATOPS	Naval Air Training Operating Procedures Standardization
NAVAIR	Naval Air Systems Command
NAVFAC PAC	Naval Facilities Engineering Command, Pacific Division
NEESA	Naval Energy and Environmental Support Activity
NEPA	National Environmental Policy Act
NFESC	Naval Facilities Engineering Service Center
NHL	National Historic Landmark
NHO	Native Hawaiian organizations
NHPA	National Historic Preservation Act
NLAA	not likely to adversely affect
NMFS	National Marine Fisheries Service
NM	nautical mile(s)
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanographic and Atmospheric Administration
NOE	nap of the earth
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System

NPS	National Park Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NSA	National Security Agency
NSC	Navy Safety Center
NUWC	Naval Undersea Warfare Center
NVD	night vision device
O&T	Operations and Training
OAA	Ordnance Assembly Area
OEP	Office of Environmental Planning (State Department of Health)
OEQC	Office of Environmental Quality Control
OESO	Ordnance Environment Support Office
PA	Programmatic Agreement
PACOM	U.S. Pacific Command
PCB	polychlorinated biphenyls
PHRI	Paul H. Rosendahl, Ph.D., Inc
PM	particulate matter
PMR	Pacific Missile Range
PMRF	Pacific Missile Range Facility
POI	points of interest
PP	Puu Papaa
PPA	Pollution Prevention Act of 1990
ppb	parts per billion
ppm	parts per million
PPV	Public/Private Venture
PSD	Prevention of Significant Deterioration program
PTA	Pohakuloa Training Area
PV	photovoltaic
QDR	Quadrennial Defense Review Report
RCRA	Resource Conservation and Recovery Act
RDT&E	Research, Development, Testing and Evaluation
RECP	Resident Energy Conservation Program
RI	Remedial Investigation

RIMPAC	Rim of the Pacific
RNM	Rotorcraft Noise Model
ROD	Record of Decision
ROI	region of influence
ROG	reactive organic gases
SAAF	short austere airfield
SBER	Schofield Barracks East Range
SBCT	Stryker Brigade Combat Team
SBMR	Schofield Barracks Military Reservation
SCS	Soil Conservation Service (U.S. Department of Agriculture)
SDZ	surface danger zone
SECNAVINST	Secretary of the Navy Instruction
SEL	sound exposure level
SF	square feet
SHPO	State Historic Preservation Officer
SM	square meters
SO_2	sulfur dioxide
SOP	standing/standard operating procedures
SPCC	Spill Prevention, Control and Countermeasure
State	State of Hawaii
SUA	Special Use Airspace
T&R	Training and Readiness
TAC(A)	Tactical Air Controller (Airborne)
TCP	traditional cultural properties
TERF	terrain flight
tpy	tons per year
TRAP	Tactical Recovery of Aircraft and Personnel
TSCA	Toxic Substances Control Act of 1976
202K	202,000 Marines (manning goal of Grow the Force)
UBC	Unified Building Code
UDP	Unit Deployment Program
UFC	Unified Facilities Criteria
UNFCCC	United Nations Framework Convention on Climate Change

USAG-HI	U.S. Army Garrison Hawaii
U.S.	United States
U.S.C.	U.S. Code
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDA SCS	Soil Conservation Service, U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USMC	U.S. Marine Corps
UST	underground storage tank
USW	undersea warfare
VFR	Visual Flight Rules
VMM	Marine Medium Tiltrotor (squadron)
VMR	Marine Transport Squadron
vog	volcanic smog
VP	Patrol Squadron
VPU	Special Projects Patrol Unit
VR-51	Fleet Logistics Support Squadron 51
WAAF	Wheeler Army Airfield
WFMP	Wildlife Fire Management Plan
WMA	Wildlife Management Area
WRF	Water Reclamation Facility
WWTP	Wastewater Treatment Plant
yd	yard(s)

EXECUTIVE SUMMARY

Executive Summary

The Department of the Navy (DoN) has prepared this Final Environmental Impact Statement (EIS) to assess potential environmental impacts associated with the proposed basing of the MV-22 Osprey tiltrotor aircraft and H-1 Cobra and Huey attack and utility helicopters in Hawaii. The proposed introduction of these aircraft is part of the Marine Corps' plan to restructure and rebase its forces in the Pacific over the next ten years, and to better integrate its aviation assets with ground and command elements in the Marine Forces Pacific (MARFORPAC) region of operation.

The proposed action would:

(1) base and operate up to two Marine Medium Tiltrotor (VMM) squadrons (a total of 24 MV-22 aircraft, 12 in each squadron) and one Marine Light Attack Helicopter (HMLA) squadron (15 AH-1 Cobra and 12 UH-1 Huey helicopters) in Hawaii, and

(2) attain and maintain proficiency in the employment of the MV-22, AH-1, and UH-1 aircraft by conducting aviation training, readiness, and special exercise operations at statewide training facilities.

The DoN has prepared this EIS in accordance with National Environmental Policy Act of 1969 (NEPA), 42 United States Code (U.S.C.) §4321-4374, as implemented by the Council on Environmental Quality (CEQ) regulations, 40 Code of Federal Regulations (CFR) §§1500-1508; *DoN Procedures for Implementing NEPA* (32 CFR §775); Marine Corps Order (MCO) 5090.2A (with Changes 1, 2) *Marine Corps Environmental Compliance and Protection Manual,* Chapter 12 (HQMC 2009b). Pursuant to CEQ §1501.6, a cooperating agency is defined as any other federal agency that has jurisdiction by law or special expertise with respect to any environmental issue, which should be addressed in the EIS. Because aviation training would occur on land currently owned or controlled by the Department of the Army, the Department of the Army is a cooperating agency.

ES.1 PURPOSE AND NEED

The *purpose* of the proposed action is to ensure that the Marine Air-Ground Task Force (MAGTF) is capable of supporting the needs of the Third Marine Expeditionary Force (III MEF) operational commander to carry out legally mandated responsibilities in Hawaii. To accomplish this, a MAGTF must train as it fights, that is, as a single unit combining four elements of a MAGTF: command element (CE), ground combat element (GCE), aviation combat element (ACE), and logistics combat element (LCE). Of particular importance is the ability to coordinate air and ground elements. Operational training for ground troops in Hawaii is currently limited by the lack of specific aviation assets for troop transport and offensive air support.

The *need* for the proposed action is to eliminate existing rotary-wing deficiencies of the MAGTF in Hawaii and the need for work-arounds through gap deployments from elsewhere (e.g., from the continental United States [U.S.]). With the proposed VMM squadrons, the medium-lift capability needed for assault support transport of combat troops, equipment, and supplies would be partially satisfied with aviation assets that represent available "next generation equipment"—the MV-22 Osprey. With the proposed basing of the HMLA squadron and its AH-1 and UH-1 aircraft, routine training in Hawaii with offensive air support, utility support, armed escort, and airborne support for arms coordination would be possible. Furthermore, a permanently assigned HMLA squadron in Hawaii, with its six- to seven-month deployed detachment (subset of the squadron) complementing the 31st Marine Expeditionary Unit (31st MEU) in Okinawa under the Unit Deployment Program (UDP), would provide III MEF with the constant presence of a full complement of rotary-wing squadrons for training and "real world" contingency operations.

ES.2 PROPOSED ACTION AND ALTERNATIVES

The Marine Corps proposes to (1) base and operate up to two VMM squadrons and one HMLA squadron in Hawaii, and (2) conduct aviation training, readiness, and special exercise operations to attain and maintain proficiency in the employment of the MV-22 and H-1 (AH-1 and UH-1) aircraft, at training areas statewide. Operational requirements associated with this proposed action were identified in order to conduct a systematic analysis to identify suitable basing locations (Section 2.3). As a result of this analysis, only one installation met all requirements—Marine Corps Base (MCB) Hawaii Kaneohe Bay—and the alternatives ultimately carried forward for evaluation in this EIS are essentially facility layout alternatives. In Alternative A, all aviation facilities would be on the south side of the runway. In Alternative B, VMM facilities would be located on the northwest side of the runway at West Field. Alternative B includes construction of a runway underpass for access. Plans for new bachelor enlisted quarters (BEQ) facilities would also differ between alternatives. Aviation training, readiness, and special exercise operations associated with each facilities alternative would be identical.

Projects proposed to support the VMM and HMLA squadrons at MCB Hawaii Kaneohe Bay include demolition, renovation and/or construction of facilities, including hangars, taxiway and parking apron improvements; additional BEQs; Marine Aviation Group 24 (MAG-24) headquarters and parking structure; and expansion of Marine Aviation Logistics Squadron 24 (MALS-24) aircraft maintenance facilities. Existing facilities would be used to the extent possible.

The planning horizon used to analyze this proposed action is the year 2018. Personnel increases would occur from 2012 through 2018, in phase with the delivery of aircraft. Approximately 1,000 active-duty personnel, 22 civilian personnel (contractors and government employees), and 1,106 dependents would be associated with the VMM and HMLA squadrons. Construction would be phased over six to ten years.

ES.2.1 ALTERNATIVE A

Alternative A (Figure ES-1 and Table ES-1) would accommodate all of the aviation facilities on the south side of the runway. Several of these projects would require demolition of existing buildings and construction of replacement facilities elsewhere on the base for the units being displaced. Descriptions of the proposed Alternative A facilities follow.

- For the VMM squadrons, construct two hangars, required aprons, water tank and fire suppression system, an intermediate maintenance facility, and washrack.
- For the HMLA squadron, renovate existing Hangar 101 and adjacent apron. The hangar and apron are registered as a National Historic Landmark.
- For MALS-24, renovate and expand existing facilities, construct a new supply warehouse and consolidate mobile maintenance facilities (called vans) near the maintenance shops, expand composite components shop, and expand the existing armory to accommodate additional weapons.
- For MAG-24, replace existing headquarters and aid station with new facility, including a parking structure.
- To provide additional bachelor housing, demolish six existing BEQ buildings and construct three new four-story buildings with approximately 304 rooms. Each room would accommodate one or two persons. The six buildings, eligible for listing on the National Register of Historic Places (NRHP), are very old, difficult to maintain, do not provide a good quality of life for residents, and are not energy efficient. The chilled water plant and associated covered walkways on the site would also be demolished. A multi-story parking structure would be built for resident parking.
- To accommodate the increase in flight operations, construct an additional reinforced concrete landing pad at West Field connected to the existing taxiway.

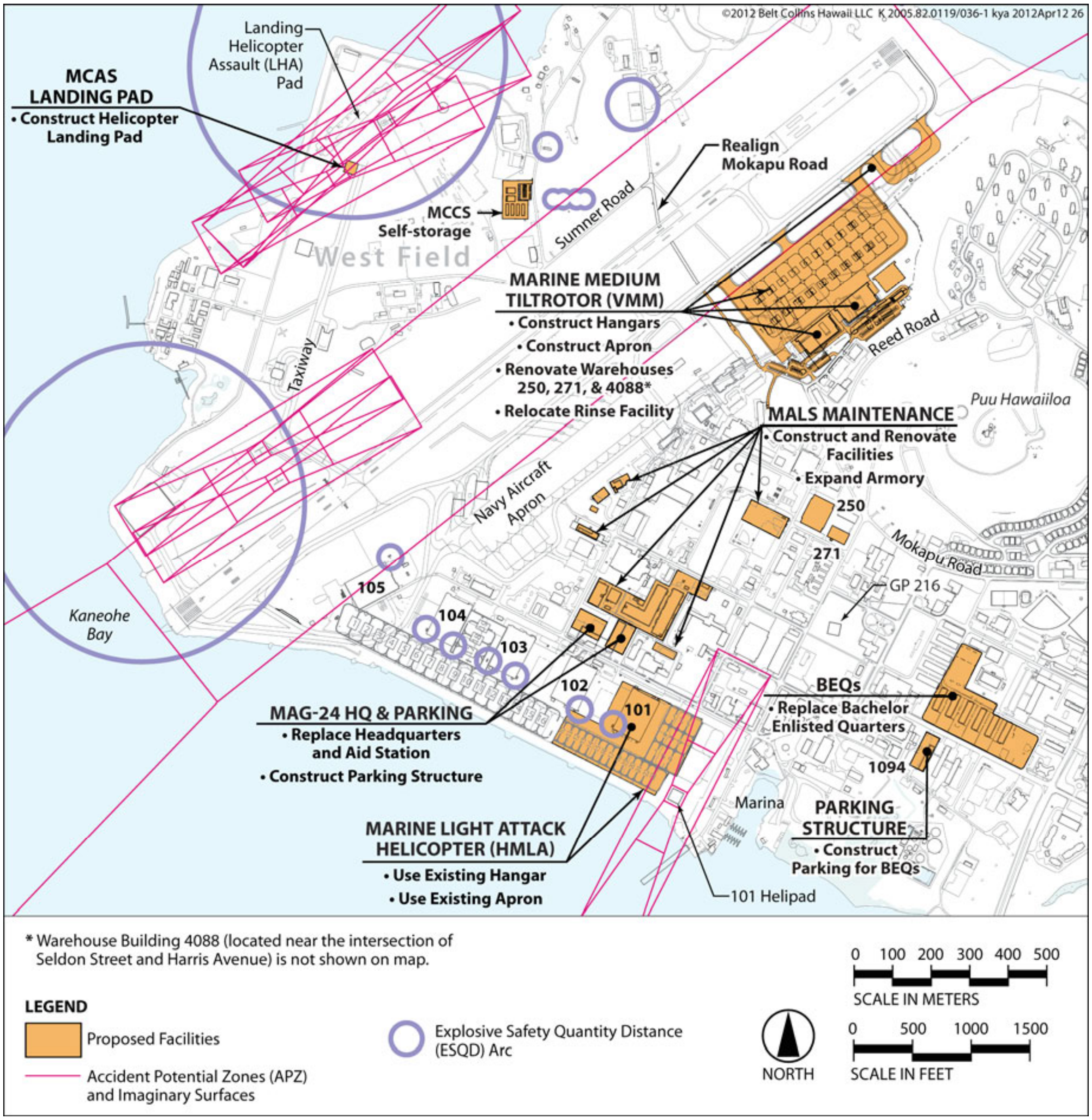

Figure ES-1. Alternative A – Overview, MCB Hawaii Kaneohe Bay

Table ES-1. Alternative A: Facilities Improvements

Facility	Location	Improvements (Building Number)	Approximate Scope
VMM hangar and apron	Northeast of runway	Realign Mokapu Road	2,300 ft (701 m)
		Demolish warehouses and storage facilities (4005, 4075, 4000, 584, 1197, 5068, 6678, 6679, 6680, 6681, 6682, and 6683)	-94,300 SF (-8,760 SM)
		Renovate warehouses (4088, 250, and 271)	100,400 SF (9,330 SM)
		Replace/relocate CIF warehouse (4075)	38,500 SF (3,577 SM)
		Replace MAG-24 warehouse (4005)	10,000 SF (929 SM)
		Replace family housing and operations warehouse (4005 and 4000)	15,000 SF (1,394 SM)
		Replace MCCS self-storage facilities (6678, 6679, 6680, 6681, 6682, and 6683)	16,000 SF (1,486 SM)
		Construct hangar and IMF	144,000 SF (13,378 SM)
		Construct apron, wash rack, and taxiway	110,600 SY (92,476 SM)
HMLA hangar and apron	Hangar 101	Renovate Hangar 101	117,800 SF (10,944 SM)
		Resurface and reseal aprons for HMLA	31,100 SY (26,004 SM)
MALS-24 maintenance shops, warehouse, and armory	MALS-24 maintenance area	Demolish engine test cell near the corrosion control hangar (1178)	-2,700 SF (-251 SM)
		Expand composite shop at corrosion control hangar (5069)	11,400 SF (1,059 SM)
		Demolish van pads (5049, 5050, 5053, 5064)	-13,100 SY (-1,0953 SM)
		Construct new van pads	12,700 SY (10,620 SM)
		Construct MALS-24 warehouse	57,700 SF (5,361 SM)
		Replace van pads	12,700 SY (10,619 SM)
		Expand armory (4054)	11,700 SF (1,087 SM)
MAG-24 HQ	301	Demolish MAG-24 HQ (301)	-35,000 SF (-3,252 SM)
		Construct MAG-24 HQ	44,500 SF (4,134 SM)
		Construct parking structure	21,100 SY (17,642 SM)
MCAS helicopter landing pad	West Field	Construct helicopter landing pad for MV-22	1,111 SY (929 SM)
Bachelor housing	3rd Street and 503	Demolish existing BEQs (225, 226, 227, 228, 229, and 230) and associated structures (3000, 1001 to 1006)	-102,300 SF (9,504 SM)
		Replace with three four-story BEQs	181,700 SF (16,880 SM)
		Demolish existing building (1094) for parking structure	-21,000 SF (1,950 SM)
		Construct parking structure	17,500 SY (14,632 SM)
		Improve existing parking lot	10,700 SY (8,950 SM)

1 ft = feet; SF = square feet; SY = square yards; m = meters; SM = square meters; MCAS = Marine Corps Air Station

Proposed operations and construction at aviation training areas would be the same, regardless of which alternative is selected for the siting of the VMM and HMLA squadrons' facilities at MCB Hawaii Kaneohe Bay. Aviation training would be conducted at available military installations and ranges (Figure ES-2), as well as at non-military sites, in the state of Hawaii. All of these facilities are currently used or have been used for training by the Marine Corps, Army, and other U.S. Department of Defense (DoD) services. At the time of this FEIS publication, one exception to continued use of aviation training at non-military sites is being contemplated. The proposed use of Kalaupapa Airport by the HMLA squadron is being discussed as part of National Historic Preservation Act (NHPA) Section 106 consultation. Determinations resulting from this consultation process will be documented in a Programmatic Agreement that must be finalized prior to implementation of the proposed action. Section 4.9.3.5 presents a range of contemplated uses at Kalaupapa Airport (including no new use) under this proposed action and evaluates resulting environmental impacts. Should the outcome of the NHPA Section 106 consultation process differ substantially from that disclosed in this FEIS, additional documentation will be prepared by the DoN to satisfy the NEPA.

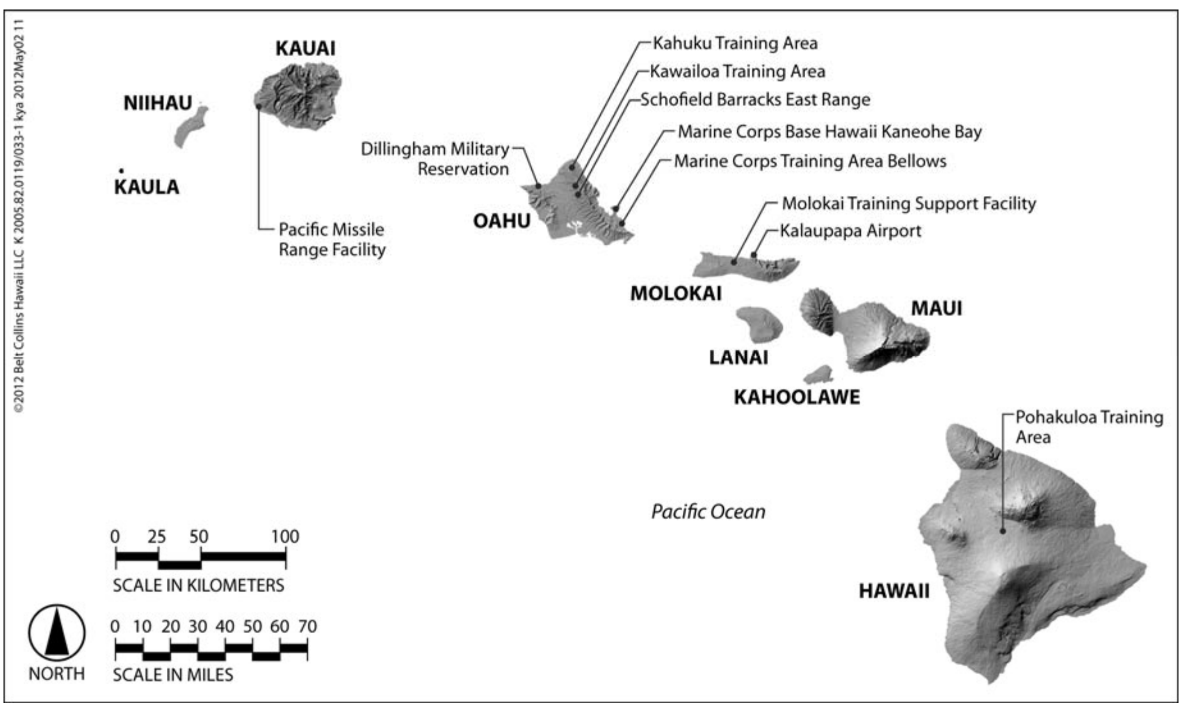

Figure ES-2. Training Areas in Hawaii

Table ES-2 identifies the training areas/facilities to be used for tactical training by the VMM and HMLA squadrons and evaluated in this EIS. (The Hawaii Army National Guard [HIARNG] facility on Maui is not included in this table as HIARNG would not be used for tactical aviation training. However, the Marine Corps' use of the HIARNG Facility would be a new activity and is therefore evaluated in this document.)

Table ES-2. Areas/Facilities Proposed for Tactical Aviation Training

Island	Owner	Site	Description	LZ/DZ/Helipad/Airfield[1]
Oahu	U.S. Government under Marine Corps control	MCB Hawaii Kaneohe Bay	MCB Hawaii Kaneohe Bay is the main base for MCB Hawaii. The 2,951-ac (1,194.22-ha) site is located at Mokapu Peninsula on the windward side of Oahu. MCB Hawaii Kaneohe Bay provides housing, administrative offices, training facilities, community services, and support to marines, sailors, and other military personnel.	Boondocker
		MCTAB	MCTAB is part of MCB Hawaii. The 1,074-ac (434.6-ha) site is located in Waimanalo on the windward side of Oahu. MCTAB provides training land for both aviation and ground units.	Tiger, Noni, Gull, Hawk, Owl
Oahu (cont'd)	U.S. Government under Army control by ownership or land leases	Schofield Barracks East Range (SBER)	East Range is part of Schofield Barracks Military Reservation, located in central Oahu. SBER (5,154 ac [2,085.8 ha]) provides training land for tactical field exercises.	Lightning, Italy, Ku Tree, Lower 36, Lower 72, Upper 36, Upper 72
		Kahuku Training Area (KTA)	The 9,398-ac (3,803-ha) site is bounded by Kawailoa Training Area (KLOA) to the south, private agricultural land to the north, and other private land on the remaining perimeter.	Kanes, Kahuku Split Rock, X Strip
		Kawailoa Training Area (KLOA)	KLOA is bounded by SBER to the south and KTA to the north. KLOA is primarily used for helicopter aviation training. At 23,300 ac (9,429 ha), it is the largest contiguous ground maneuver training area on the island.	Black, Elephants Foot, Nixon, Non Stop, Puu Kapu, Red

Table ES-2. Areas/Facilities Proposed for Tactical Aviation Training

Island	Owner	Site	Description	LZ/DZ/Helipad/Airfield[1]
	U.S. Government under Army control; airfield is leased and operated by the State DOT Airports Division	Dillingham Airfield	Dillingham Military Reservation (DMR) is a 664-ac (267.7-ha) site located on Oahu's northwest shore. The 272-ac (110-ha) airfield is a joint-use general aviation facility for the public and military. Military activities consist largely of night operations and small unit maneuvers.	Airfield, Albatross, Blue Jay, Dillingham DZ, Finch, Rooster
Hawaii	U.S. Government under Army control by ownership and land leases	Pohakuloa Training Area (PTA)	PTA is the largest military training area on the island of Hawaii, located between the mountains of Mauna Loa and Mauna Kea, PTA consists of 131,805 ac (53,339.6 ha) which include areas for ground maneuver and ordnance impact. Ground maneuver areas can support large-scale training, including live-fire training.	Fisher DZ, Mikilua DZ, FARP 12A, FARP 17, FARP 18, Brad, Noble, Rob, Tango, T11, Xray, Yankee, Zulu, Buzzard, Chick, Dodo, Dove, Emu, Finch, Gamecock, Kiwi, Loon, Parrot Option, Peacock, Penguin, Robin, Rooster, Seagull, Turkey
		Bradshaw Army Airfield (BAAF)	Located within PTA, BAAF consists of a 4,750-ft (1,448-m) runway and other aviation facilities.	Airfield, Alpha, Bravo, Charlie Helipads
Kauai	U.S. Government under Navy control	Pacific Missile Range Facility (PMRF)	PMRF is a multi-environment range capable of supporting surface, subsurface, air, and space events simultaneously. Training, as well as Research, Development, Testing and Evaluation (RDT&E) activities are also supported. Located at this 2,400-ac (971-ha) facility on the west side of Kauai is the Barking Sands airfield. Offshore Navy training exercises include electronic combat operations, Special Warfare Operations (SPECWAROPS), Mine Countermeasures, and flare exercises.	Barking Sands Airfield
Kaula	U.S., Government under Navy control	Designated target range area	Kaula is a small 108-ac (43.7-ha) crescent-shaped island located southwest of Niihau. A 10-ac (4-ha) portion at the southern end of Kaula is used by the Navy for aircraft gunnery and inert ordnance target practice.	None

Table ES-2. Areas/Facilities Proposed for Tactical Aviation Training

Island	Owner	Site	Description	LZ/DZ/Helipad/Airfield[1]
Molokai	U.S. Government under Marine Corps control	Molokai Training Support Facility (MTSF)	MTSF is an inactive, vacant 12-ac (4.9-ha) site located across the highway from Molokai Airport. It was previously used for fueling and facilities support for training activities at the former Molokai Training Area.	MTSF to be used to support FARP training.
	State of Hawaii under DOT Airports Division control	Kalaupapa Airport[1]	This approximately 55-ac (22.3-ha) airport serves the residents of Kalaupapa Settlement and visitors to Kalaupapa National Historic Park. Military operations at the runway are primarily aviation night vision training.[2]	Airfield

Notes

Abbreviations and acronyms:

ac = acres; ha = hectare; LZ = landing zone; DZ = Drop Zone; FARP = Forward Arming and Refueling Point

1 Any use under this proposed action to be determined through continuing NHPA Section 106 consultation.

In addition, the squadrons are expected to use State of Hawaii airports and other DoD airfields and helipads that are routinely used by existing Marine Corps squadrons for flight operations, refueling, and related activities. Specific training exercises would be conducted at selected facilities from time to time, with approval from the State Department of Transportation (DOT) Airports Division; their use would be considered administrative, for example, transporting personnel and emergency evacuation.

To support the MV-22 and H-1 aircraft, physical improvements to existing training facilities are proposed at Marine Corps Training Area Bellows (MCTAB), Pohakuloa Training Area (PTA), and the Molokai Training Support Facility (MTSF) (Table ES-3). The projects at MCTAB and PTA focus on landing zones considered either substandard or inadequate[1] for use by the

[1] A landing zone (LZ) may be considered substandard or inadequate because it does not fully satisfy MV-22 support requirements as derived from the MV-22 Facilities Requirements Document or applicable Unified Facilities Criteria (UFCs). Substandard conditions could be mitigated through minor repairs or construction, while inadequate LZs may require major upgrades, repairs, or construction. Factors taken into account include the size of the LZ, condition of the surface, and presence of nearby obstructions.

MV-22 aircraft and therefore involve enlarging the landing zone and/or paving, along with associated clearing, grubbing, and grading.

MTSF would be used to support Forward Arming and Refueling Point (FARP) training activities for the Marine Wing Support Detachment (MWSD). The facility would support refueling training activities by providing a secured area for MWSD and equipment. Limited improvements may include clearing and grubbing, and grading and paving if needed. A fence would be installed around the property. Aircraft would land at Molokai Airport for refueling operations. MTSF would also serve as an emergency divert landing area in the event aircraft carrying unarmed ordnance transiting between Oahu and the island of Hawaii encounter bad weather or problems with the aircraft.

Table ES-3. Proposed Training Facilities Improvements

Area	Facility/LZ	Improvement	Approximate Scope
Oahu			
MCTAB	Gull	Reinforce concrete	1,110 SY (928 SM)
MCTAB	Hawk	Reinforce concrete	1,110 SY (928 SM)
MCTAB	Owl	Reinforce concrete	1,110 SY (928 SM)
MCTAB	Noni	Reinforce concrete	1,110 SY (928 SM)
Hawaii			
PTA	Bravo	Expand existing helipads	15,000 SY (12,542 SM)
Molokai			
MTSF		Clear, grub, grade, pave	2,220 SY (1,839 SM)
MTSF		Install fence	3,200 ft (975 m)

SY = square yards; ft = feet; m = meters

ES.2.2 ALTERNATIVE B

Alternative B (Figure ES-3 and Table ES-4) includes the same basing facilities and training activities as described for Alternative A above, with the following differences.

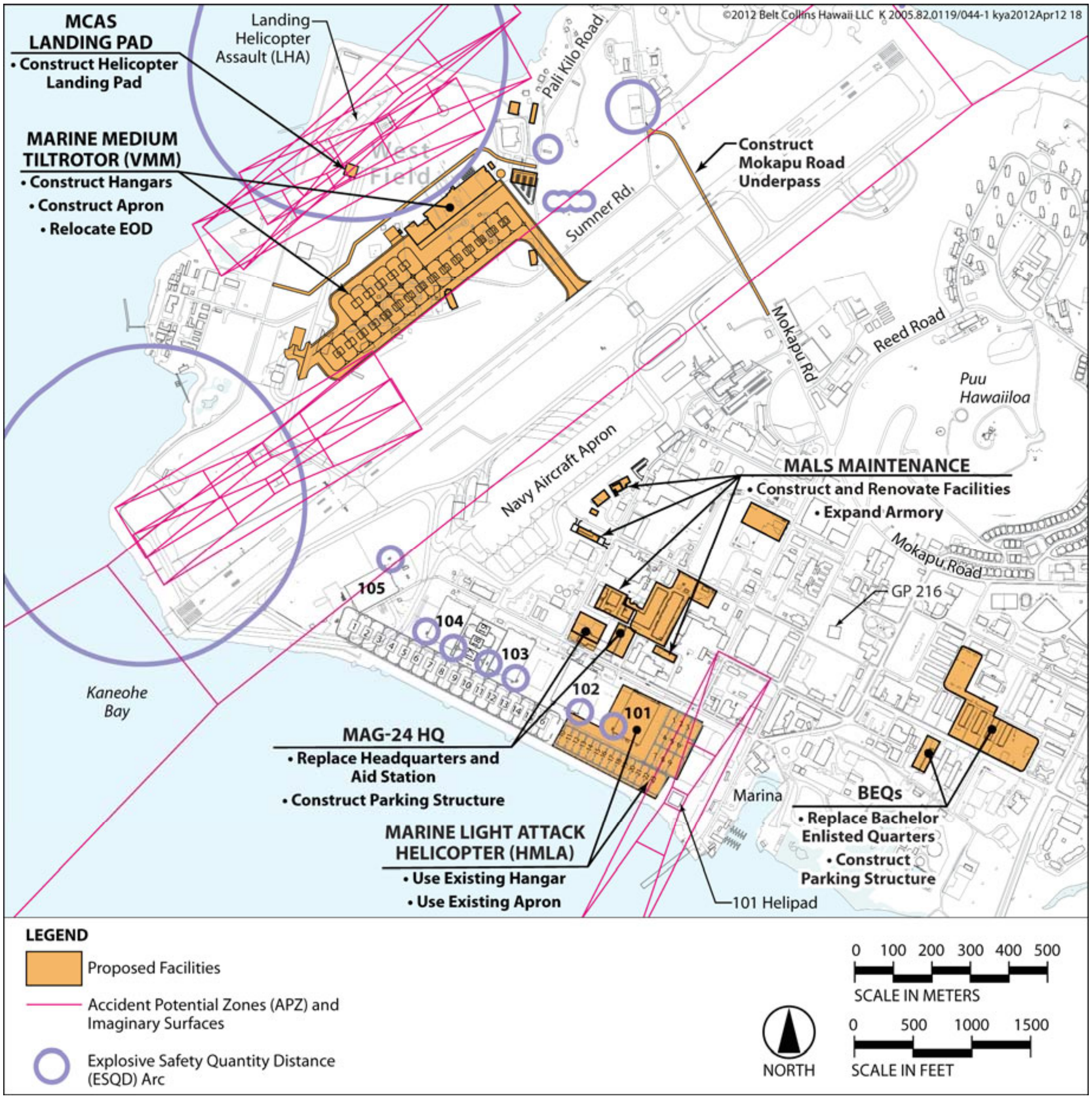

Figure ES-3. Alternative B – Overview, MCB Hawaii Kaneohe Bay

Table ES-4. Alternative B: Facilities Improvements

Facility	Location	Improvements (Building Number)	Approximate Scope
VMM hangar and apron	West Field (northwest of runway)	Demolish facilities and structures (14, 15, 17, 612, 601, 602, 620, 3076, 3077, 3078, 3079, 3087, 6183, 3099, 995, and 6478)	-25,800 SF (-2,397 SM)
		Demolish aircraft power check pad (5020)	-3,790 SY (-352 SM)
		Construct hangar and IMF	144,000 SF (13,378 SM)
		Construct apron, wash rack, and taxiway	140,200 SY (117,225 SM)
		Replace MCAS storage (601, 602, 620)	6,900 SF (641 SM)
		Replace MALS engine test facility (6183)	1,250 SF (116 SM)
		Replace game warden office and kennel (3099)	850 SF (79 SM)
		Replace aircraft power check pad (5020)	3,790 SY (3,169 SM)
		Realign Sumner Road	2,740 ft (835 m)
HMLA hangar and apron	Hangar 101	Renovate Hangar 101	117,800 SF (10,944 SM)
		Resurface and reseal aprons for HMLA	31,100 SY (26,004 SM)
MALS-24 maintenance shops, warehouse, and armory	MALS-24 maintenance area	Demolish engine test cell near the corrosion control hangar (1178)	-2,700 SF (-251 SM)
		Expand composite shop at corrosion control hangar (5069)	11,400 SF (1,059 SM)
		Demolish van pads (5049, 5050, 5053, 5064)	-13,100 SY (-10,953 SM)
		Construct new van pads	12,700 SY (10,620 SM)
		Construct MALS-24 warehouse	57,700 SF (5,361 SM)
		Expand armory (4054)	11,700 SF (1,087 SM)
MAG-24 HQ	301	Demolish MAG-24 HQ (301)	-35,000 SF (-3,252 SM)
		Construct MAG-24 HQ	44,500 SF (4,134 SM)
		Construct parking structure	21,100 SY (17,642 SM)
MCAS helicopter landing pad	West Field	Construct helicopter landing pad for MV-22	1,111 SY (103 SM)
Bachelor housing	3rd Street and 503	Demolish existing BEQs (227, 228, 229, and 230) and associated structures (3000, 1001 to 1006)	-68,200 SF (-6,336 SM)
		Replace with two six-story BEQs	181,700 SF (16,880 SM)
		Demolish existing building (1094) for parking structure	-21,000 SF (1,950 SM)
		Construct parking structure	17,500 SY (14,632 SM)
		Improve existing parking lot	10,700 SF (8,950 SM)

1 ft = feet; M = meters; SF = square feet; SM = square meters; SY = square yards; MCAS = Marine Corps Air Station

- Construct the VMM squadron facilities at West Field on the northwest side of the runway. To provide space for the hangars, apron, taxiway, and washrack, demolish existing structures and construct required replacement facilities at other locations. Ten of the buildings proposed for demolition are eligible for the NRHP. In addition, this project would require realignment of Sumner Road.
- To accommodate the increase in vehicular traffic due to personnel traveling to and from West Field, construct a 2,000-foot (ft) (600-meter [m])-long, 65-ft (20-m)-wide underpass near Mokapu Road under the runway. The underpass would be a tunnel with divided lanes and a clearance height of 14 ft (4.3 m). Utility lines would be relocated and a tunnel drainage system would be constructed to handle storm water runoff. The project would involve excavation and removal of over 140,000 cubic yards (107,038 cubic meters) of material, installation of earth retaining and lateral support systems, dewatering, and subgrade preparation.
- To provide additional bachelor housing, demolish four (instead of six under Alternative A) NRHP-eligible BEQ buildings and construct two new six-story BEQ buildings (instead of three four-story structures). The capacity would be the same as Alternative A—approximately 304 rooms. The two remaining NRHP-eligible buildings would be retained and reused for administrative or other support functions as part of a separate action. The chilled water plant and associated covered walkways on the site would be demolished. Improvements would be made to the existing parking lot north of the BEQs.

ES.2.3 NO ACTION ALTERNATIVE

Analysis of the No Action Alternative provides a benchmark that enables decision-makers to evaluate the environmental consequences of the proposed alternatives. Section 1502.14(d) of the NEPA requires an EIS to analyze the No Action Alternative. No action means that an action would not take place, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed basing activities to go forward.

In the No Action Alternative (year 2018), the VMM and HMLA squadrons would not be based in Hawaii and no facilities would be constructed at MCB Hawaii Kaneohe Bay or at any of the other training areas to accommodate them. The HMLA squadron proposed for assignment in Hawaii would remain at MCB Camp Pendleton in California. The VMM squadrons would be based elsewhere. MAG-24's Marine Heavy Helicopter (HMH) squadrons would convert from CH-53Ds to CH-53Es and reduce from three to two squadrons.

With the No Action Alternative, VMM and HMLA aviation operations would not be conducted at the training areas, and improvements to training area facilities would not be constructed. The Marine Corps would continue existing operations at the training areas.

The No Action Alternative would not meet mission requirements. MAG-24 would not have the "next generation equipment" needed to support III MEF—the MV-22 Osprey, with its ability to take off vertically, transition to airplane mode for forward flight, and convert to helicopter mode for landing. The 3d Regiment at MCB Hawaii Kaneohe Bay would continue to lack specific aviation assets for troop transport and offensive air support. To address existing deficiencies, MAG-24 would continue work-arounds through gap deployment from elsewhere, for example, from the continental U.S.

ES.3 PREFERRED ALTERNATIVE

The DoN has selected Alternative A as the Preferred Alternative. The Preferred Alternative would base and operate up to two VMM squadrons and one HMLA squadron in Hawaii; accommodate all of the basing aviation facilities on the southeast side of the runway at MCB Hawaii Kaneohe Bay; improve existing training areas at MCTAB, PTA, and MTSF; and conduct aviation training, readiness, and special exercise operations at training areas statewide.

ES.4 ENVIRONMENTAL CONSEQUENCES

A summary comparison of the potential impacts associated with the proposed action alternatives (A and B) and the No Action Alternative is presented in Chapter 6. For most resources/issues, no significant impacts would be associated with either Alternative A or Alternative B. Changes in environmental conditions under the action alternatives would be small when compared to existing conditions (baseline) and the No Action Alternative. For example, modeling of aircraft noise at MCB Hawaii Kaneohe Bay shows changes in noise levels at noise sensitive areas ranging from 1.3 to 3.0 Day-Night Average Sound Level (DNL) compared to baseline, and from 0.3 to 1.1 DNL compared to the No Action Alternative.[2] Fixed-wing aircraft would continue to be the primary contributors to noise in the environs. However, regardless of the degree of impact associated with noise from the proposed action, it is recognized that noise is an environmentally controversial issue based on public input and involvement.

Most impacts, regardless of the action alternative selected, would be avoided or minimized through implementation of existing management measures in compliance with applicable laws, regulations, orders, best management practices (BMPs), and/or standing operating procedures (SOPs). Examples include compliance with National Pollutant Discharge Elimination System (NPDES) permit requirements to avoid/minimize construction-related

[2] DNL are cumulative sound levels that account for the exposure of all noise events in a 24-hour period.

runoff, and compliance with existing base orders and SOPs regarding wildland fire management and response protocols. With respect to the General Conformity Regulations, 40 CFR Parts 51 and 93, pursuant to section 176(c) of the Clean Air Act, emissions from the proposed action are not subject to these regulations since the entire state is in attainment of the National Ambient Air Quality Standards (NAAQS).

Mitigation is required for only a small number of resource areas; the Marine Corps would be responsible for implementing any mitigation measures. Brief summaries of resources requiring mitigation are presented in Table ES-5. More details are presented in Chapter 6.

Table ES-5. Resource Impacts Requiring Mitigation

Resource	Alternative A (Preferred Alternative)	Alternative B	No Action Alternative
Geology, Soils, Topography	*Other Training Areas*: MV-22 downdraft could cause soil erosion at unpaved LZs at SBER and certain parts of KLOA because of the relatively high erosion potential in those areas.	*Other Training Areas*: Same as Alternative A.	*Other Training Areas*: No impact.
	Mitigation: Operators would monitor conditions at SBER and KLOA LZs. If field observations verify that erosion is occurring, the Marine Corps would work with the range manager to implement appropriate repairs or other maintenance actions If needed, mitigation may include use of other LZs with less erosion potential and/or improvements to LZs to minimize impacts.	*Mitigation*: Same as Alternative A.	*Mitigation*: None.
Historic Buildings	*MCB Hawaii Kaneohe Bay*: This alternative may have an adverse effect on nine NRHP eligible facilities proposed for renovation and seven proposed for demolition, including the demolition of six historic BEQs.	*MCB Hawaii Kaneohe Bay:* This alternative may have an adverse effect on nine NRHP eligible facilities proposed for renovation and 15 proposed for demolition, including the demolition of four historic BEQs.	*MCB Hawaii Kaneohe Bay:* No impact.
	Mitigation: Mitigation is documented in the Programmatic Agreement (PA) developed during the NHPA Section 106 process.	*Mitigation:* Same as Alternative A.	*Mitigation:* None.

Table ES-5. Resource Impacts Requiring Mitigation

Resource	Alternative A (Preferred Alternative)	Alternative B	No Action Alternative
Archaeological Resources	*MCB Hawaii Kaneohe Bay:* Impacts on archaeological resources are possible during ground disturbance associated with construction. The potential for encountering disturbed human remains in sand fill exists for all construction projects. MV-22 rotor downwash impacts on archaeological sites at LZs are not likely. There is a potential for adverse effects on Site 4933 associated with the MALS composite shop, warehouse, and armory project.	*MCB Hawaii Kaneohe Bay:* Impacts on archaeological resources are possible during ground disturbance associated with construction. The potential for encountering disturbed human remains in sand fill exists for all construction projects. MV-22 rotor downwash impacts on archaeological sites at LZs are not likely. There is a potential for adverse effects on Site 4933 associated with the MALS composite shop, warehouse, and armory project. There is a potential for adverse effects on the Mokapu House Lots complex (a National Historic District) associated with the VMM facilities at West Field.	*Construction.* No impact.
	Other Training Areas: This alternative may have an adverse effect on subsurface archaeological deposits associated with three LZs at MCTAB if ground disturbance occurs more than 12 inches (30 cm) in depth. Downwash impacts are possible at KTA, KLOA, SBER, and PTA, where there is potential for encountering surface and subsurface features where archaeological surveys have not been completed. The extent of impacts would depend on the location and depth of such features.	*Other Training Areas:* Same as Alternative A.	*Other Training Areas:* No impact.
	Mitigation: Mitigation of adverse effects is documented in the Programmatic Agreement (PA) developed during the NHPA Section 106 process..	*Mitigation:* Same as Alternative A.	*Mitigation:* None.

Table ES-5. Resource Impacts Requiring Mitigation

Resource	Alternative A (Preferred Alternative)	Alternative B	No Action Alternative
Roadways and Traffic	*MCB Hawaii Kaneohe Bay:* All base intersections except three would operate at acceptable levels of service. Increased traffic at entry gates and at the runway crossing may decrease efficiency.	*MCB Hawaii Kaneohe Bay:* Same as Alternative A. However, with construction of the runway underpass, runway crossing delays would be eliminated.	*MCB Hawaii Kaneohe Bay:* All intersections except one would operate at acceptable levels of service.
	Mitigation: Widen the eastbound approach at G Street, Lawrence Street, and Mokapu Road. Install an additional right turn lane on southbound Reed Road at the intersection with Mokapu Road. Restripe the southbound approach at Selden and Craig Avenue to provide a separate right turn lane. Improve gate procedures to increase capacity and efficiency.	*Mitigation:* Same as Alternative A.	*Mitigation:* Restripe the intersection of Selden Street and Craig Avenue.

ES.5 ORGANIZATION OF THE EIS

Chapter 1 presents the purpose and need for the proposed action, describes the public involvement and scoping process, identifies related planning efforts, and lists applicable government permits, consultations, laws, and executive orders. Chapter 1 also includes a summary of revisions made to the Draft EIS that are reflected in this Final EIS. Chapter 2 describes the proposed action and alternatives, the alternatives development process, and the screening of issues and resources to determine those to be carried forward for more study in the EIS. Existing conditions and environmental impacts of the proposed action (construction and operations) are assessed for MCB Hawaii Kaneohe Bay in Chapter 3 and for the other training areas in Chapter 4. Chapter 5 provides an analysis of cumulative impacts, Chapter 6 summarizes impacts, and Chapter 7 discusses other considerations required by NEPA. Those involved in preparing the EIS are identified in Chapter 8, references are listed in Chapter 9, and the DEIS and FEIS distribution lists are presented in Chapter 10.

The appendices include documents associated with the NEPA process, the federal consultation processes, as well as studies conducted as part of this EIS and other supporting/supplementary information.

ES.6 PUBLIC INVOLVEMENT

Scoping[3] was initiated on August 6, 2010, with publication of a Notice of Intent (NOI) to prepare an EIS in the *Federal Register* and a mailing of the NOI to approximately 165 parties. Between August 6 to 11, 2010, the NOI and public scoping meetings were announced in newspapers on the islands of Kauai, Oahu, Molokai, and Hawaii and in the State of Hawaii Office of Environmental Quality Control's (OEQC) *Environmental Notice*. Concurrent with publication of the NOI, a press release was issued to the media and the project website was launched. Community assessment interviews were conducted with community stakeholders to inform them about the proposed action and the scoping meetings and to obtain comments.

Five public scoping meetings were held between August 24 to 30, 2010, on the islands of Hawaii, Oahu, and Molokai. Approximately 123 people attended the scoping meetings, and 32 oral comments were recorded at the meetings. A total of 85 written comments were received (several individuals submitted multiple comments) by September 30, 2010, the end of the public scoping period.[4] See Appendix A for scoping documents, including copies of the NOI, written comments, and recorded oral comments.

A Notice of Availability (NOA) of the Draft EIS has been published in the *Federal Register* on November 10, 2011 and announced in other media. The Draft EIS was available for public comment on the EIS website (www.mcbh.usmc.mil/mv22h1eis), the OEQC website, and at public libraries listed in the NOA, which is posted on the website. During the 45-day comment period, public meetings/open houses were held on the islands of Hawaii and Oahu. The DoN integrated the NEPA and NHPA public involvement processes. Public meetings provided opportunities for the public to comment on the Draft EIS and provide input to the NHPA Section 106 process.

The DoN received written comments on the Draft EIS at the public meetings/open houses, by mail, and by email via the EIS website—a total of 168 comment letters. Oral comments were received at the public meetings/open houses.

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3 Scoping is an early and open process for actively and constructively bringing agencies, organizations, and the public into the NEPA process to determine the nature and extent of issues to be addressed and to identify major issues related to the proposed action.

4 The 30-day public scoping period, which formally ended on September 6, 2010, was extended in response to requests by participants at the Waimanalo meeting.

CHAPTER 1

Purpose and Need

Purpose and Need

1.1 INTRODUCTION

This Environmental Impact Statement (EIS) presents an analysis of the potential environmental impacts that may result from the Department of the Navy's (DoN) proposed basing of the MV-22 Osprey tiltrotor aircraft and H-1 Cobra and Huey attack and utility helicopters in Hawaii. Following public review, the EIS will be finalized and used by the Secretary of the Navy or his designee to issue a Record of Decision (ROD).

MV-22

AH-1Z

UH-1Y

The DoN has prepared this EIS in accordance with the National Environmental Policy Act of 1969 (NEPA), 42 United States Code (U.S.C.) §4321-4374, as implemented by the Council on Environmental Quality (CEQ) regulations, 40 Code of Federal Regulations (CFR) §§1500-1508; *DoN Procedures for Implementing NEPA* (32 CFR §775); Marine Corps Order 5090.2A (with Changes 1, 2); and the *Marine Corps Environmental Compliance and Protection Manual,* Chapter 12 (HQMC 2009b). Pursuant to CEQ §1501.6, a cooperating agency is defined as any other federal agency that has jurisdiction by law or special expertise with respect to any environmental issue, which should be addressed in the EIS. Because aviation training would occur on land currently owned or controlled by the Department of the Army, the Department of the Army is a cooperating agency.

The proposed action addressed in this EIS results from the vision and initiatives identified in the *Fiscal Year (FY) 2011 Marine Aviation Plan* (HQMC 2010b). This plan envisions the Marine Corps in 2025 as "a fast, lethal expeditionary force that is ready for the uncertainties of future combat operations, yet has the staying power of engagement in the most austere conditions imaginable." To achieve this vision, the Marine Corps must restructure and rebase its forces in the Pacific over the next 10 years, and Marine Aviation must better integrate its assets with ground and command elements in the Marine Forces Pacific (MARFORPAC) region of operation. The proposed action, described by its two main components below, accomplishes a portion of these goals.

Basing and Operation of Aviation Squadrons

Basing and operation of up to two Marine Medium Tiltrotor (VMM) squadrons (a total of 24 MV-22 Osprey aircraft, 12 in each squadron) and one Marine Light Attack Helicopter (HMLA) squadron (15 AH-1 Cobra and 12 UH-1 Huey attack and utility helicopters) are proposed to support Marine Corps operations in Hawaii. The new VMM squadrons would provide tiltrotor medium-lift capability[1] with the advanced MV-22 Osprey aircraft. The MV-22 Osprey has the ability to take off vertically, transition to airplane mode for forward flight, and convert to helicopter mode for landing. The HMLA squadron would be relocated from Marine Corps Base (MCB) Camp Pendleton to Marine Air Group 24 (MAG-24) and would provide rotary-wing light-lift[2] and attack capabilities. The AH-1 Cobra is an attack helicopter for ground and air targets, and the UH-1 Huey is a utility helicopter for troop and cargo transport, surveillance, and close air support.

Facilities would be renovated or constructed to accommodate and maintain the VMM and HMLA squadrons. Such facilities include taxiways, aprons, hangars, support facilities, and infrastructure. Construction would be phased over six to ten years.

The planning horizon used to analyze this proposed action is the year 2018. Personnel increases would occur from 2012 through 2018, in phase with delivery of the aircraft. Approximately 1,000 active-duty personnel, 22 civilian personnel (contractors and government employees), and 1,106 dependents would be associated with the VMM and HMLA squadrons.

Aviation Training

Training, readiness, and special exercise operations would be conducted at statewide training facilities to attain and maintain proficiency in the operational employment of the MV-22 and H-1 aircraft. These operations may occur at the existing facilities shown in Figure 1-1. New construction or improvements to existing landing zones and other facilities are proposed at three training areas: Marine Corps Training Area Bellows (MCTAB) on the island of Oahu, Pohakuloa Training Area (PTA) on the island of Hawaii, and Molokai Training Support Facility (MTSF) on the island of Molokai. Other airfields in Hawaii available for aviation use would include those operated by the State of Hawaii Department of Transportation, Airports Division, and other Department of Defense (DoD) airfields on Oahu.

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[1] Medium lift refers to the maximum take-off weight of the aircraft as defined in the Joint Chiefs of Staff Joint Publication 3-04 *Joint Shipboard Helicopter Operations* (JCS 2008). The CH-53D's maximum gross weight is approximately 42,000 pounds (U.S. Navy, Naval Air Systems Command. Aircraft and Weapons: H-53 Helicopters. www.navair.navy.mil/index.cfm?fuseaction=home.displayPlatform&key=8F1AC977-7DFC-4C0E-846D-93E88411A8D7. Accessed October 6, 2011.

[2] Light lift refers to the maximum take-off weight of the aircraft as defined in the Joint Chiefs of Staff Joint Publication 3-04 *Joint Shipboard Helicopter Operations* (September 2008). The UH-1Y's maximum gross weight is approximately 18,500 pounds (Bell Helicopter Textron Inc. 2006. *UH-1Y Pocket Guide.*)

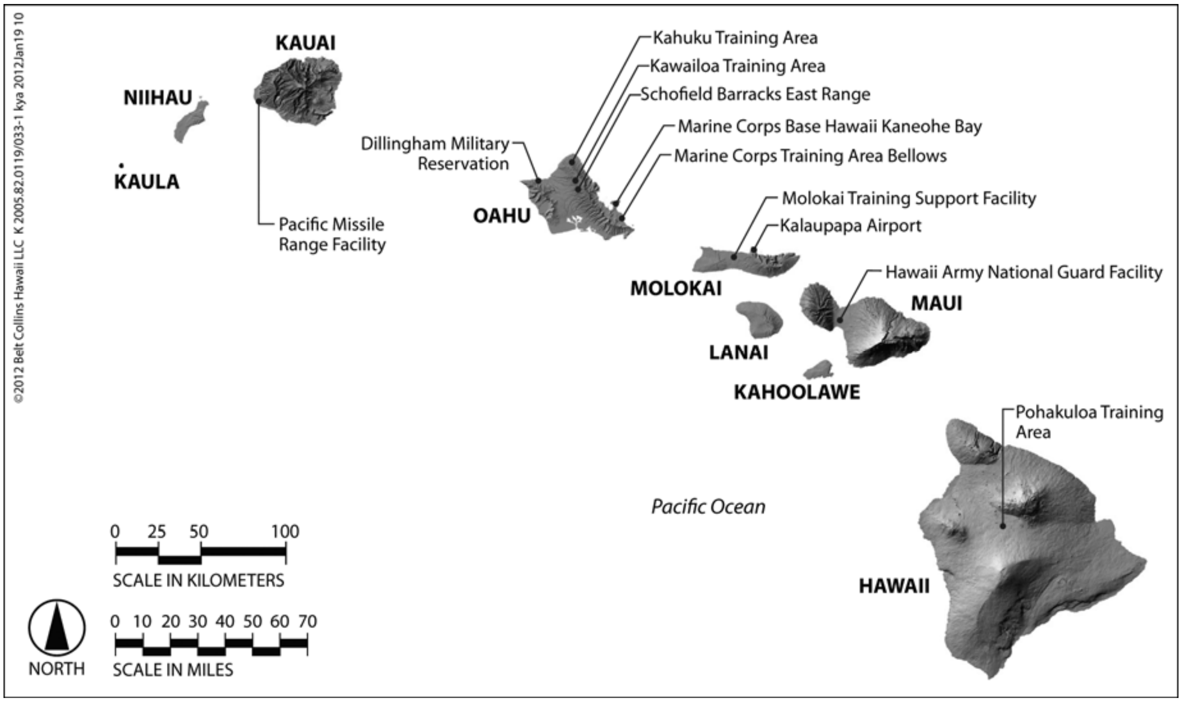

Figure 1-1. Training Areas in Hawaii

Although the MV-22 is now based on the East and West coast of the continental U.S. and it has performed extremely well in theater operations, it would still be a new type of aircraft for the Marine Corps in Hawaii. This EIS incorporates the most up-to-date information regarding expected training operations across the state of Hawaii. As the Marine Corps collectively gains experience with this new platform, greater understanding of its capabilities and limitations may lead to changes in operations and training. Use of best available information provides the public, agencies, and decision makers with the ability to evaluate the consequences of the proposed action in accordance with CEQ regulations (specifically 40 Code of Federal Regulations [CFR] 1500.1[B]). As the MV-22 program evolves, the DoN will monitor its implementation, identify potential environmental consequences, evaluate results in relation to new information, and inform the public of substantive changes.

This chapter is organized into the following sections. Section 1.2 provides background information about the Marine Corps organization, facilities, units, and aircraft, which is useful in understanding the purpose and need. Section 1.3 defines the purpose of and need for the proposed action. Section 1.4 describes the approaches used to involve the public during scoping and the Draft EIS review. Section 1.5 summarizes the issues and concerns identified during the required EIS public scoping period and Draft EIS public review period. Section 1.6 identifies related planning efforts that may affect the proposed action. Section 1.7 identifies applicable permits, consultations, laws, and executive orders. Section 1.8 summarizes the substantive changes and clarifications presented in the Final EIS. Finally, Section 1.9 describes the organization of this EIS by chapter.

1.2 BACKGROUND INFORMATION

This section provides the context needed to understand the purpose and need later described in Section 1.3. First, the Marine Corps' organizational structure in Hawaii is defined. Second, the Marine Corps' facilities, units, and aircraft in Hawaii are described. This background information identifies deficiencies in the operational structure and airlift capability (need) that the proposed action is intended to address.

1.2.1 MARINE CORPS ORGANIZATION

The Marine Corps organizes its operations by forming Marine Air-Ground Task Forces (MAGTFs) consisting of four core elements: command element (CE), ground combat element (GCE), aviation combat element (ACE), and logistics combat element (LCE). MAGTFs vary in size and capability according to the assigned mission, threat, and battle space environment, and are designed to be flexible, e.g., vary in size and composition, as needed. Examples of MAGTF types and the corresponding rank of their commanders are: Marine Expeditionary Unit (MEU), commanded by a colonel; Marine Expeditionary Brigade (MEB), commanded by a brigadier or major general; and Marine Expeditionary Force (MEF), commanded by a lieutenant general. MEFs are the largest MAGTF. As shown in Figure 1-2, the Marine Corps has three standing MEFs. Whether small or large, all elements (CE, GCE, ACE, and LCE) of a MAGTF must conduct frequent, integrated training to assure readiness.

Figure 1-2 shows the organization of Third MEF (III MEF) elements in Hawaii. (Corresponding levels of detail are not presented under I and II MEF and other elements of III MEF in Japan since they are not the subject of this EIS.) Although the III MEF is headquartered in Okinawa, Japan, a smaller MAGTF that is part of the III MEF is based at MCB Hawaii Kaneohe Bay. The MCB Hawaii MAGTF elements include 3D Radio Battalion (CE), 3d Regiment and 1/12 Artillery Battalion (GCE), MAG-24 (ACE), as well as Combat Logistics Battalion 3 (CLB-3) and 21st Dental Company (LCE), among others.

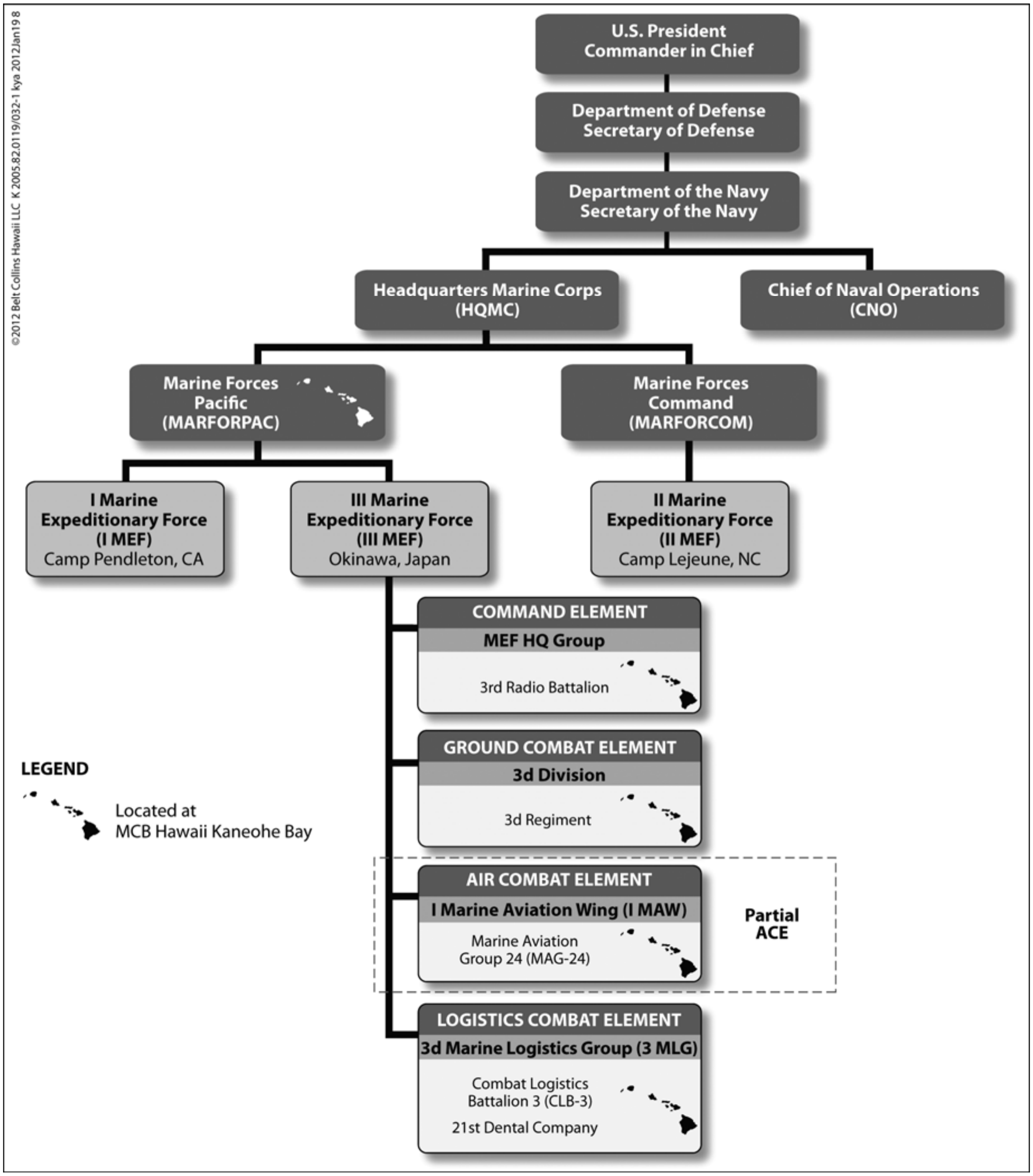

Figure 1-2. Marine Corps Organization

Figure 1-2 also highlights the MAGTF (CE, GCE, ACE, and LCE) and the specific ACE that this proposed action addresses. At present, no rotary-wing light-lift or attack aircraft are based in Hawaii for this ACE. The existing CH-53Ds provide medium-lift capability.[3]

CH-53D

1.2.2 MARINE CORPS BASE HAWAII FACILITIES, UNITS, AND AIRCRAFT

Marine Corps facilities in Hawaii are under the command of MCB Hawaii, headquartered at MCB Hawaii Kaneohe Bay. MCB Hawaii's mission is "to provide facilities, programs, and services in direct support of units, individuals, and families in order to enhance and sustain combat readiness for all operating forces and tenant organizations aboard MCBH."[4] Figure 1-3 shows MCB Hawaii facilities on Oahu. Brief descriptions of MCB Hawaii facilities, units, and aircraft relevant to the proposed action are described later in this section.

MCB Hawaii Kaneohe Bay. Kaneohe Bay on the windward side (northeast part) of the island of Oahu is MCB Hawaii's headquarters where MAGTF elements are based and conduct limited training (see Figure 1-4). Neighboring communities include Kailua and Kaneohe. In 2010, MCB Hawaii Kaneohe Bay supported approximately 21,000 people. On-base military personnel and dependents numbered 16,000, with the remaining 5,000 living off base.[5] MCB Hawaii Kaneohe Bay, along with Marine Corps Air Station (MCAS) Kaneohe Bay, provides administrative, housing, facility maintenance, and training support for most personnel stationed at MCB Hawaii facilities.

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[3] The *Joint Shipboard Helicopter Operations* (JCS 2008) provides rotorcraft take-off weight classifications. The CH-53Ds were considered heavy-lift aircraft when the Marine Corps acquired them in the 1970s. Over time, the criteria for the weight classification has changed, which resulted in the CH-53Ds eventually becoming a "medium lift" aircraft. However, the HMH designation of the CH-53D was not changed to HMM (Marine Medium Helicopter Squadron).

[4] *Marine Corps Base Strategic Plan 2009-2013*. http://www.mcbh.usmc.mil/Strat/MV.htm. Accessed November 10, 2010.

[5] Base loading for 2010 provided by MCB Hawaii Kaneohe Bay.

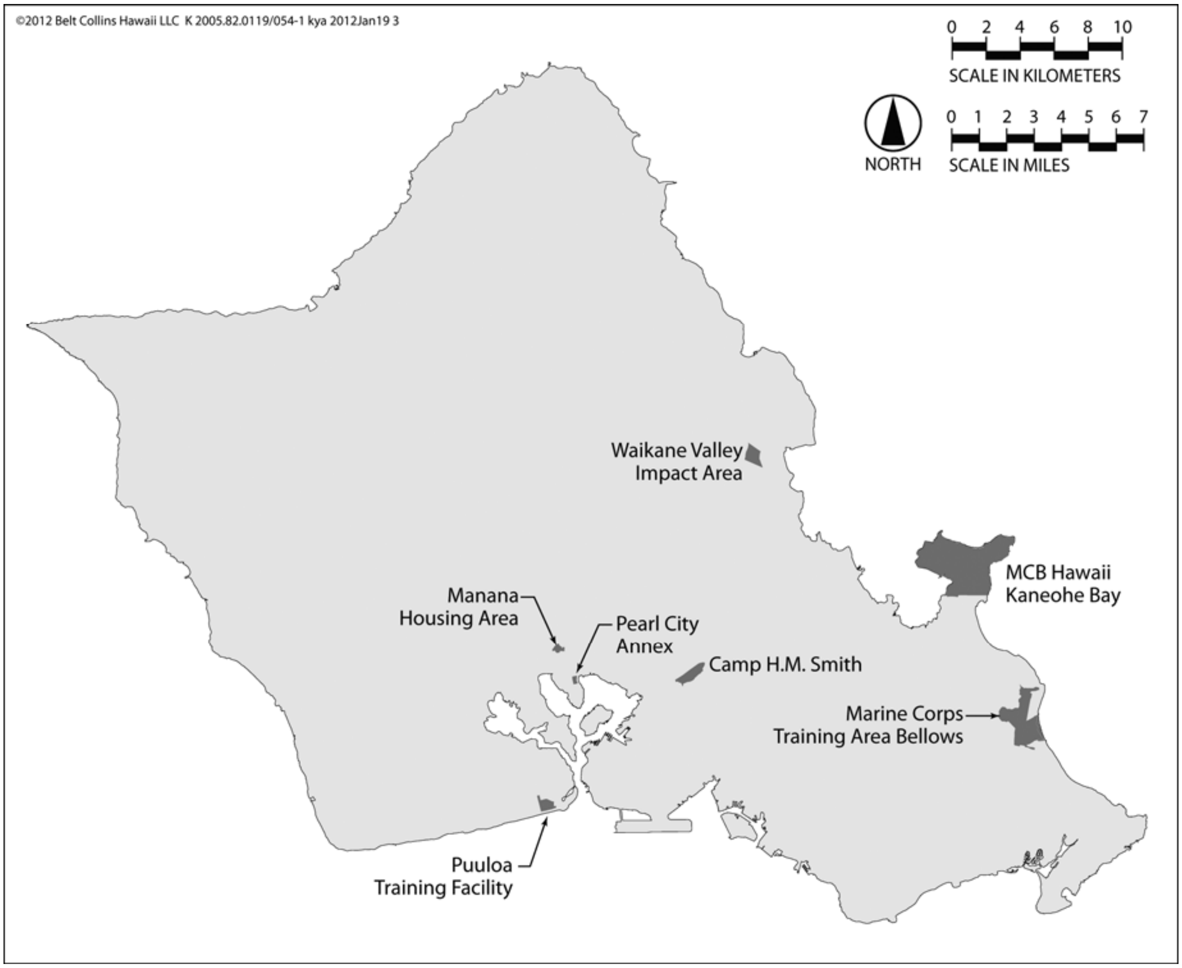
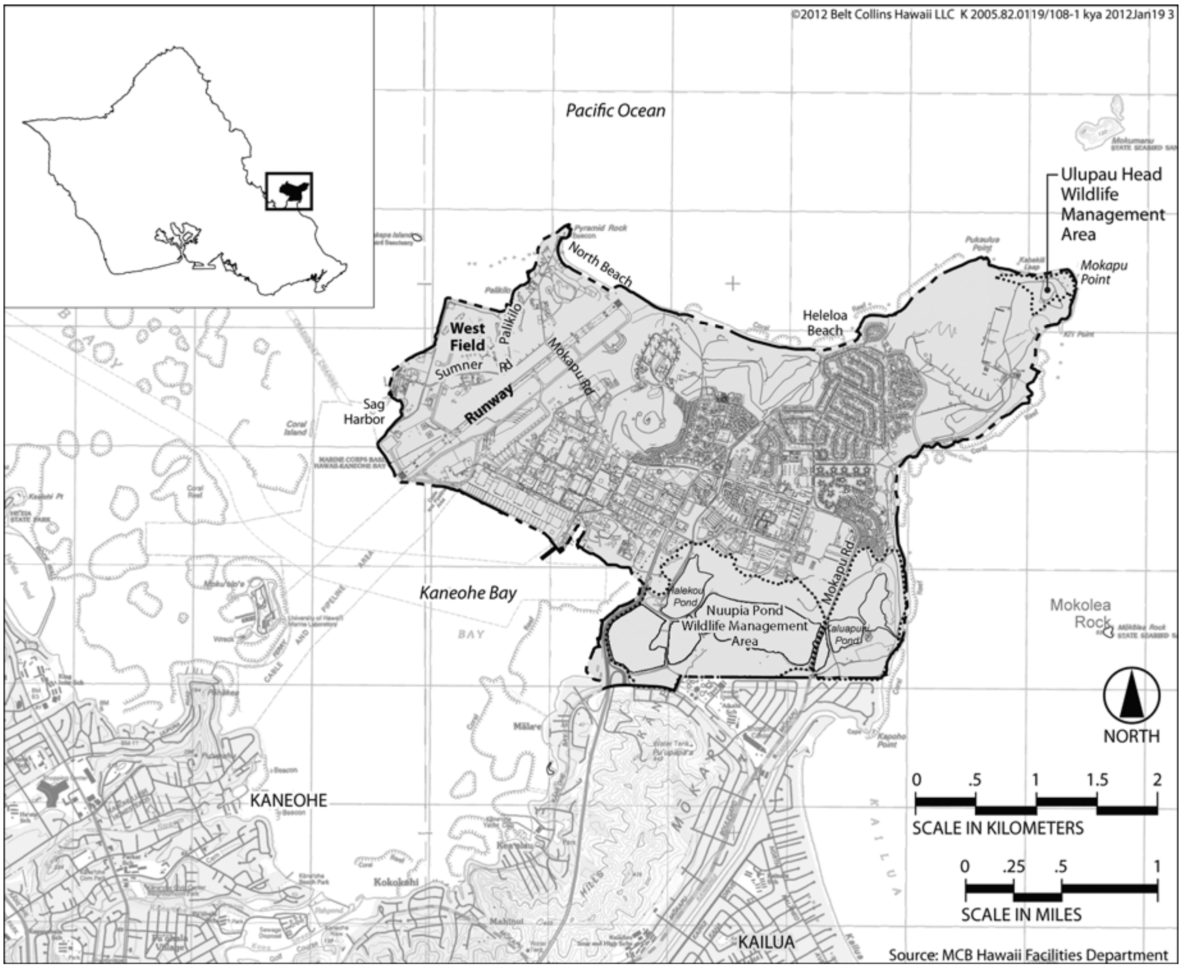


Figure 1-3. MCB Hawaii Oahu Facilities

1


2 **Figure 1-4. MCB Hawaii Kaneohe Bay**

Table 1-1 describes the major Marine Corps units stationed at MCB Hawaii Kaneohe Bay and highlights the deficient ACE that the proposed action is intended to address.

Table 1-1. Marine Corps Units at MCB Hawaii Kaneohe Bay

Element	Unit	Description
Command Element	▪ 3D Radio Battalion	3D Radio Battalion provides signals and electronics intelligence support to MARFORPAC and III MEF.
Ground Combat Element	▪ 3d Regiment	The 3d Marine Regiment is the major infantry command at MCB Hawaii. It consists of three infantry battalions, one Combat Assault Company, and one headquarters element. Unit Deployment Program (UDP): When UDP is active, one infantry battalion is deployed to Okinawa for approximately six months.
	▪ 1/12 Artillery Battalion	The 1st Battalion, 12th Marine Regiment (1/12) provides artillery support to the 3d Regiment. The 1/12 is made up of four firing batteries and one headquarters battery. UDP: Under UDP, one battery is deployed to the Western Pacific for approximately six to seven months.
	▪ 4th Force Reconnaissance Company Detachment (Reserves)	The primary mission of a Force Recon unit is reconnaissance in order to collect intelligence, and observe, identify, and report adversaries to MAGTF commanders.
	▪ Anti-Terrorism Battalion (ATBN) (Reserves)	ATBN has two companies located at MCB Hawaii Kaneohe Bay. The ATBN's mission is to deter, detect, defend against, and respond to acts of domestic and international terrorism.
Aviation Combat Element	▪ Marine Aviation Group 24 (MAG-24)	MAG-24 provides aviation support forces to 3d Regiment. MAG-24 consists of three heavy-lift helicopter squadrons (providing medium-lift support), one maintenance squadron, and one headquarters element. UDP: Under UDP, one squadron is deployed to the Western Pacific for approximately six to seven months.
	▪ Marine Aviation Logistics Squadron 24 (MALS-24)	Under the command of MAG-24, MALS-24 provides aviation maintenance and logistics support to Marine and Navy aircraft at MCB Hawaii.

Table 1-1. Marine Corps Units at MCB Hawaii Kaneohe Bay

Element	Unit	Description
Logistics Combat Element	▪ Combat Logistics Battalion 3 (CLB-3)	CLB-3 provides direct logistics support to 3d Regiment and general support to III MEF forces in Hawaii.
	▪ 21st Dental Company	The 21st Dental Company provides general dental support to all Marines and sailors stationed at MCB Hawaii Kaneohe Bay.
Base Support	▪ Marine Corps Base Hawaii (MCB Hawaii)	The base oversees the operation of all Marine Corps facilities and personnel in Hawaii.
	▪ Headquarters Battalion (HQBN)	HQBN provides administrative, operational, and training support to MCB Hawaii.
	▪ Marine Corps Air Station (MCAS) Kaneohe Bay	Part of MCB Hawaii, MCAS oversees the maintenance and operation of all airfield activities at MCB Hawaii.

Note: The UDP is a process that provides for the deployment of units to the Western Pacific (WESTPAC) for periods of approximately six to seven months. Hawaii units are typically deployed to Okinawa. (U.S. Marine Corps Headquarters. October 2001. *Manpower Unit Deployment Program Standing Operating Procedures.* Marine Corps Order P3000.15B.)

Shaded area highlights the existing ACE that is the focus of the proposed action.

A major tenant at MCB Hawaii Kaneohe Bay is the U.S. Navy's Commander, Patrol and Reconnaissance Wing 2 (CPRW-2). This wing provides expeditionary patrol and reconnaissance forces in support of the 3rd, 5th, and 7th Fleet operations. Patrol squadrons under CPRW-2 are Patrol Squadron 4 (VP-4), VP-9, VP-47, and Special Projects Patrol Unit (VPU-2). Other squadrons under CPRW-2 administrative control are: Helicopter Anti-Submarine Squadron Light 37 (HSL-37) and Fleet Logistics Support Squadron 51 (VR-51). HSL-37 performs undersea warfare (USW), anti-surface warfare (ASW), and other non-combat missions when aboard a ship. VR-51, a Navy Reserve squadron, provides worldwide Navy Unique Fleet Essential Airlift for all supported commands.

MCAS Kaneohe Bay, a subcommand located at MCB Hawaii Kaneohe Bay, supports both rotary and fixed wing aircraft. MCAS Kaneohe Bay operates and maintains air station facilities and manages airfield activities in support of III MEF and other visiting forces. Types of Marine Corps and Navy aircraft currently stationed at MCAS Hawaii Kaneohe Bay, as well as those proposed for future stationing, are shown in Table 1-2. With the retirement of the CH-53D, as part of a separate Marine Corps action, CH-53D medium-lift capability would not be available. Medium-lift capability would be partially satisfied with the addition of the VMM squadron.

Table 1-2. Aircraft Stationed at MCAS Kaneohe Bay (2009)

Squadron	Current Aircraft	Future Aircraft Proposed Under Other Actions (not part of the proposed action)
Marine Corps		
Marine Heavy Helicopter Squadron (HMH-362, 363, and 463)	CH-53D Sea Stallion (currently used to provide medium-lift capability)[3]	CH-53E Super Stallion CH-53K is the eventual replacement
MCAS VIP transport (VMR Detachment)	C-20G (Gulfstream IV)	C-20RA
Navy		
Patrol Squadron VP-4, 9, 47	P-3C Orion	P-8A MMA[1]
Patrol Squadron Special Projects (VPU-2)	P-3C Orion (Update)*	P-3C Orion (Update)[2]
Helicopter Anti-Submarine Squadron Light (HSL-37)	SH-60 Seahawk	MH-60
Fleet Logistics Support Wing Det (VR-51)	C-20G (Gulfstream IV)	C-20G

1 U.S. Navy. November 2008. *Final EIS for the Introduction of the P-8A Multi-Mission Aircraft into the U.S. Navy Fleet.*

2 The P-3C Update aircraft is not part of the P-8A replacement action. The P-3C Update will still be in use after the P-8A replacement program is completed. (Navy 2008b))

3 Replacement of the CH-53D with CH-53E began in September 2011.

Shaded area highlights medium-lift capability that is being retired under a separate action. Resulting medium-lift deficiency (need) would be addressed with the proposed action.

Other users of MCAS Kaneohe Bay facilities include:

- Transient Marine Corps and Navy squadrons
- Air Force (C-17 training, fighter jets, cargo aircraft)
- Army helicopters (CH-47, OH-58, UH-60)
- Foreign nations (P-3s, fighter jets)
- Participants in large scale Department of Defense exercises, such as Rim of the Pacific (RIMPAC).

In addition to MCB Hawaii Kaneohe Bay, two other MCB Hawaii facilities are included in this EIS: MCTAB and MTSF, briefly described below.

Marine Corps Training Area Bellows (MCTAB). MCTAB provides a beach (amphibious) landing and maneuver areas, and serves as the primary amphibious assault training area for the Marine

Corps in Hawaii. The 1,049-acre [ac] (425-hectare [ha]) (NAVFAC PAC 2002) site, formerly controlled by the Air Force, is adjacent to Bellows Air Force Station (AFS). MCTAB would be used for training by the new squadrons, and improvements are proposed at existing landing zones.

Molokai Training Support Facility (MTSF). This inactive 12-ac(4.8-ha) site[6] is located on land owned by the Marine Corps across State Highway 460 from Molokai Airport on the island of Molokai (see Figure 1-1). It once provided fueling and facilities support for training activities at the former Molokai Training Area (MTA). MTA operated under a right-of-entry permit from the State Department of Hawaiian Home Lands (DHHL) from 1983 to 1996. When the permit expired in 1996, the Marine Corps ceased training and closed MTA. MTSF became an inactive site and is now vacant, with all the support facilities demolished. Support facilities included helicopter landing pad and parking apron, areas for tent bivouacking, temporary billeting, warehousing, tool shed and garage, and fueling systems. With the proposed action, MTSF would be reactivated for Forward Arming and Refueling Point (FARP) training activities for the Marine Wing Support Detachment (MWSD). Limited improvements such as clearing, grubbing, and paving, if needed, are proposed.

1.3 PURPOSE AND NEED

The purpose of the proposed action is to ensure that the MAGTF is capable of supporting the needs of the III MEF operational commander to carry out legally mandated[7] responsibilities in Hawaii. To accomplish this, a MAGTF must train as it fights, that is, as a single unit combining all of the four elements of a MAGTF: command element (CE), ground combat element (GCE), aviation combat element (ACE), and logistics combat element (LCE). Readiness can only be assured through frequent, integrated training between the command, logistics, ground, and air elements of the MAGTF. Of particular importance is the ability to coordinate air and ground elements. This integrated training is required to maximize operational effectiveness, and teaches aircrews how to combine operations with other Marine or joint air and ground assets.

Operational training for ground troops in Hawaii is currently limited by the lack of specific aviation assets for troop transport and offensive air support as follows.

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[6] http://hawaii.gov/hawaiiaviation/hawaii-airfields-airports/molokai/molokai-airport, accessed on March 14, 2011. TMK zone 5, section 2, plat 04, stamped 14 Jan 1985.

[7] Title 10, United States Code Section 5063 defines the composition and functions of the U.S. Marine Corps.

- MAG-24 presently has three Marine Heavy Helicopter (HMH) squadrons flying CH-53Ds, which provide assault support transport of equipment, combat troops, and supplies during expeditionary, joint or combined operations (HQMC 2008). Once considered a heavy-lift aircraft when introduced in the late 1960s, changes in the "lift" criteria over the years have reclassified the CH-53Ds as medium-lift (JCS 2008) even though the squadron name retained the "heavy" designation. Under a separate Marine Corps action not covered in this EIS, the CH-53Ds are being retired, and will be replaced by the heavy-lift CH-53Es.[8] This will result in MAG-24 losing its medium-lift aircraft. With the proposed VMM squadrons, the medium-lift capability needed for assault support transport of combat troops, equipment, and supplies would be partially satisfied with aviation assets that represent available "next generation equipment"—the MV-22 Osprey. With its tiltrotor technology, the MV-22 Osprey offers increased speed, longer range, and greater mission versatility than a helicopter. The ACE capabilities for light-lift/attack would be satisfied with the basing of the UH-1 and AH-1 aircraft in Hawaii.
- The 3d Regiment, based at MCB Hawaii Kaneohe Bay, is the only infantry regiment within the Marine Corps that does not routinely train with rotary-wing light-lift and attack support. With the proposed basing of the HMLA squadron and its AH-1 and UH-1 aircraft, routine training in Hawaii with offensive air support, utility support, armed escort, and airborne control of support arms would be possible. A permanently assigned HMLA squadron in Hawaii, and its six- to seven-month deployed detachment (subset of the squadron) complementing the 31st MEU in Okinawa under the Unit Deployment Program (UDP), would provide the III MEF with the constant presence of a full complement of rotary-wing squadrons for training and "real world" contingency operations.

The Unit Deployment Program (UDP) rotates Hawaii and continental-U.S. units from their home base to the Western Pacific. Deployment durations are usually six to seven months, but can vary (MCO P3000.15B, 11 Oct 01).

The proposed action would enable the Marine Corps to base new aviation assets in Hawaii to support III MEF requirements, fill existing gaps in capabilities, and balance combat power more effectively throughout the MARFORPAC region of operation. By enhancing the currently incomplete ACE in Hawaii, a single deployable fighting unit would be present to support III MEF operations in the Western Pacific.

[8] Replacement of the CH-53D with the CH-53E began in September 2011.

The need for the proposed action is to correct existing rotary-wing deficiencies of the MAGTF in Hawaii and the need for work-arounds through gap deployments from elsewhere (e.g., from the continental U.S.). The purpose and need described here support the goals stated in the FY2011 Aviation Plan (AvPlan) (HQMC 2010b): (1) sustain wartime operational tempo while improving current readiness and effectiveness through efficient use of existing resources; (2) execute planned transition strategies from legacy equipment to advanced capabilities of the next generation of equipment; and (3) improve warfighting integration between the air, ground, and logistic elements of the MAGTF. In less than a decade, the Marine Corps plans to transition more than half of its squadrons to new aircraft, including the MV-22, UH-1Y, and AH-1Z aircraft. The transition has included introduction of the MV-22 on the east and west coasts of the continental U.S. to support II MEF and I MEF, respectively (USMC 2009a, Navy 1999).[9] The proposed action defined herein incorporates the introduction of UH-1/AH-1s and MV-22s in FY 2012 and FY 2014, respectively, to III MEF in Hawaii.

1.4 PUBLIC INVOLVEMENT

NEPA requires that potential impacts and issues be disclosed to affected agencies and the public. The CEQ implementing regulations (40 CFR Parts 1500-1508) prescribe specific public notification and review periods during preparation of an EIS.

1.4.1 SCOPING

Scoping is an early and open process for actively and constructively bringing outside agencies (federal, state, and local), organizations, and the public into the NEPA process; determining the nature and extent of issues to be addressed; and identifying major issues related to a proposed action (HQMC 2009a).

Notice of Intent

Scoping was initiated on August 6, 2010, with publication of the Notice of Intent (NOI) to prepare the EIS in the *Federal Register* (see Appendix A-1). On August 5, 2010, the NOI was mailed with a cover letter to approximately 165 parties on the distribution list compiled by the government (see Appendix A-2). The NOI and scoping open houses were announced in the following daily newspapers on August 6–8, 2010: *Honolulu Star-Advertiser, Garden Isle News, Hawaii Tribune Herald,* and *West Hawaii Today*. It was published in the State Office of

[9] Marine Expeditionary Forces, or MEFs, are the Marine Corps' largest MAGTFs. A MEF is task-oriented around permanent command elements and normally contains one or more Marine divisions, Marine aircraft wings, and Marine logistics groups. There are three standing MEFs across the Marine Corps (see Section 1.2).

Environmental Quality Control's *Environmental Notice* on August 9, 2010. The announcement was published in the *Molokai Dispatch* (a weekly publication) on August 11, 2010.

Press Release

Concurrent with publication of the NOI, the MCB Hawaii Public Affairs Officer issued a press release to these same newspapers and other media, as well as selected community leaders.

Website

The project website was launched on August 5, 2010. The website address is www.mcbh.usmc.mil/mv22h1eis. The website publicized the NOI and open houses, presented the NOI as published in the *Federal Register*, presented a fact sheet, summarized the NEPA process and EIS schedule, identified points of contact, and offered the means for interested parties to provide written comments or otherwise communicate with the project team via email.

Community Assessment Interviews

During the two-week period between publication of the NOI and the first scoping open house, community assessment interviews were conducted with community stakeholders (see Appendix A-3). The purpose of the interviews was to inform stakeholders about the proposed action and the public open houses, as well as obtain comments prior to the open houses, to determine issues that might be raised at these meetings.

Other Publicity

- A Waimanalo interviewee commented that word of mouth was the best method to publicize the open houses and volunteered to distribute flyers in the community. A flyer was prepared for this purpose.
- Marine Corps representatives attended Windward Oahu Neighborhood Board meetings to inform them about the proposed action.

Public Scoping Open Houses

Five open houses were conducted as follows:

- Tuesday, August 24, 2010, 5PM to 8PM, Hilo High School Cafeteria, 556 Waianuenue Avenue, Hilo, HI 96720

- Wednesday, August 25, 2010, 4PM to 7PM, Waikoloa Elementary and Middle School Cafeteria, 68-1730 Hooko Street, Waikoloa, HI 96738
- Thursday, August 26, 2010, 5PM to 8PM, King Intermediate School Cafeteria, 46-155 Kamehameha Highway, Kaneohe, HI 96744
- Saturday, August 28, 2010, 1PM to 4PM, Kaunakakai Elementary School Library, Ailoa Street, Kaunakakai, HI 96748
- Monday, August 30, 2010, 5PM to 8PM, Waimanalo Elementary and Intermediate School Cafeteria, 41-1330 Kalanianaole Highway, Waimanalo, HI 96795

Open house objectives were as follows:

- Actively engage the public.
- Determine the nature and extent of issues to be addressed: obtain comments from attendees to help determine the scope of the EIS and potentially significant issues to be analyzed in depth.

Open house attendees were invited to submit written comments on a form, provide oral comments (summarized by staff on a computer), or email comments at a later date via the website. The 30-day public scoping period formally ended on September 6, 2010.

In response to requests by participants at the Waimanalo open house, the deadline for submittal of written scoping comments was extended to September 30, 2010. This extension of the deadline was announced at the Waimanalo and Kaneohe Neighborhood Board meetings and also announced on the project website.

Approximately 123 people attended the open houses, and 32 oral comments were recorded. As of September 30, 2010, 85 written comments were received (note that several individuals submitted multiple comments). Comments received during scoping are summarized in Section 1.5. Written comments and recorded oral comments are presented in Appendix A-3.

The NOI distribution list was updated to include the following and used as the basis for distributing the Draft EIS Notice of Availability (NOA):

- Everyone who submitted written comments;
- Open house attendees who signed in;

- Individuals who requested, via email or telephone call, that they be included on the list; and
- Changes in elected and appointed government officials due to elections.

1.4.2 DRAFT EIS AND NHPA SECTION 106 PUBLIC REVIEW

Notice of Availability

Publication of the Notice of Availability (NOA) of the Draft EIS in the *Federal Register* on November 10, 2011 initiated the required 45-day public comment period for the Draft EIS. Outreach methods for publicizing the NOA and Draft EIS public meetings/open houses were similar to those used for the scoping process, adjusted and augmented as needed.

The NOA was mailed with a cover letter to all parties on the updated distribution list (Chapter 10), a total of 322 agencies, organizations, and individuals. This mailing included either a hard copy of the Draft EIS, a CD of the document in PDF, or both. Interested parties who submitted written scoping comments, attended a scoping open house, or specifically requested a copy of the Draft EIS were included in the distribution. The NOA and other announcements directed all other interested parties to the website for downloading of the Draft EIS document and to the 21 public libraries listed in Chapter 10. In addition, the DEIS was available on the State of Hawaii Office of Environmental Quality Control (OEQC) website and announced in OEQC's *Environmental Notice* published on November 23, 2011. (The *Environmental Notice* is published on the 8th and 23rd of the month.) To accommodate those with little or no access to a computer or the internet or to a public library, a limited number of hard copies were available upon request. DoN accommodated all of the requests for hard copies.

Other Publicity

Concurrent with publication of the NOA, the MCB Hawaii Public Affairs Officer issued a press release to the media. In addition, the Public Affairs Officer and other Marine Corps representatives attended Neighborhood Board meetings to inform them of the proposed action and opportunities for participating in the Draft EIS public review.

The project website was updated to include the NOA, the public meeting/open house schedule, and information on how interested parties could submit written comments or communicate with the EIS team.

Public Meetings/Open Houses

Per 36 CFR Part 800.8, DoN integrated the NEPA and National Historic Preservation Act (NHPA) public involvement processes. Public meetings provided opportunities for the public to comment on the DEIS and the NHPA Section 106 process. Section 106 consulting parties were included in the distribution of the NOA and the DEIS (either hard copy or CD).

Five public meetings/open houses were conducted as follows, with the first hour of each meeting reserved for NHPA Section 106 input. (If more time was required for this input, the NHPA Section 106 session was able to continue concurrently with the Draft EIS portion of the meeting.)

- Wednesday, November 30, 2011, 5:30-8:30 PM, Waimea Elementary School Cafeteria, 67-1225 Mamalahoa Highway, Kamuela, HI
- Thursday, December 1, 2011, 4:30-7:30 PM, Hilo Intermediate School Cafeteria, 587 Waianuenue Avenue, Hilo, HI
- Tuesday, December 6, 2011, 5:30-8:30 PM, Mililani Middle School Cafeteria, 95-1140 Lehiwa Drive, Mililani, HI
- Wednesday, December 7, 2011, 5:30-8:30 PM, Waimanalo Elementary & Intermediate School Cafeteria, 41-1330 Kalanianaole Highway, Waimanalo, HI
- Thursday, December 8, 2011, 5:30-8:30 PM, Castle High School Cafeteria, 45-386 Kaneohe Bay Drive, Kaneohe, HI

Public meeting/open house attendees were invited to submit written comments on a form, give oral comments (either to staff for recording on a computer or in a public forum), or email comments at a later date via the website or by mail. The public comment period formally ended on December 27, 2011.

Approximately 127 people attended the public meetings/open houses, seven people gave oral comments that were recorded by staff, and 56 people spoke during the public forum part of the meetings. In addition, DoN, Marine Corps, and Army cultural resource managers engaged with approximately 16 attendees who were interested in cultural resources and the Section 106 process. One attendee requested consulting party status. DoN received 39 written comments at the public meetings and an additional 129 written comments after the meetings. Written and individually recorded comments (total of 175) and responses to those comments are presented in Appendix A-5.

1.5 SUMMARY OF ISSUES AND CONCERNS IDENTIFIED

1.5.1 SCOPING COMMENTS

The comments received during the scoping process were evaluated in the context of the proposed action and alternatives. The main issue raised throughout the scoping process, at the public meetings as well as in the written comments, was noise. Summarized below are the issues raised during the scoping process.

Noise

- Noise from aircraft over-flights, night exercises, and extended periods of engines running
- Noise study methodology: concern that the results from noise modeling, which represent a 24-hour average, do not accurately characterize single noise events
- Federal, state, and other applicable noise standards
- Increased noise pollution
- Comparison with other common noise levels such as from leaf blowers or passing trucks
- Flight paths: request to keep flight paths over the ocean and not over homes
- Impacts to national parks and other applicable natural area soundscapes
- Include noise from existing aircraft in the noise analysis
- Impact of aircraft noise on the learning environment at surrounding schools

Hazardous Materials and Waste/Pollution Prevention

- Depleted uranium (DU) at PTA
- Hazardous material storage and disposal
- Jet fuel pollution

Air Quality

- Air pollution from aircraft exhaust

Land Use

- Ceded lands at MCTAB (formerly part of Bellows Air Force Station)
- Land ownership history at MCTAB

Marine Environment

- Threatened and endangered species
- Impacts on coral reefs
- Potential for inadvertent or intentional discharge of jet fuel leading to contamination of park lands and offshore coral reef habitat

Cultural Resources

- Archaeological resources and burials
- Use of sand from burial areas at MCB Hawaii Kaneohe Bay for construction of runways and other structures
- Inconsistent policies regarding access to native Hawaiian cultural areas on base

Socioeconomic Environment

- Impact on availability of affordable rentals in communities surrounding the base
- Public transit
- Traffic impacts on the surrounding street system, including impacts during construction

Safety

- Record of crashes related to the MV-22
- Potential for fires caused by engine nacelle exhaust from the MV-22 or from aircraft crashes

Infrastructure

- Water use
- Impacts on wastewater treatment plant serving the base
- Impacts on various State airport and highway facilities

Biological Resources

- Risk of spread of invasive species
- Impacts on protected bird species
- Wetlands
- Impact of aircraft noise on feral donkey population at Waikoloa

Purpose and Need

- Reasons for basing the new aircraft in Hawaii and other alternatives considered.

1.5.2 DRAFT EIS AND NHPA SECTION 106 PUBLIC REVIEW COMMENTS

As during the scoping process, the main issue raised during public review of the Draft EIS was aircraft noise, particularly at MCB Hawaii Kaneohe Bay and Upolu Airport. Summarized below are public comments on the Draft EIS, including input on cultural resources provided at the public meetings/open houses and in Draft EIS comment letters as part of the NHPA Section 106 public involvement process.

Purpose and Need

- Why do the squadrons have to be based in Hawaii?
- Request extension of comment period (not enough time allowed).
- Insufficient notice given.
- Public meetings should have been held in North Kohala and Molokai.

Proposed Action and Alternatives

- Consider other basing locations.
- Do not use Upolu Airport for training.
- Do not use Kalaupapa Airport for training.

Land Use

- Questions about public access at MCB Hawaii Kaneohe Bay, MCTAB, Upolu Airport.
- Question about Kaneohe shoreline areas being defined as low-density residential.
- Ceded lands.

Airspace

- Questions about existing aviation operations at Upolu Airport.

Air Quality

- Health impact of emissions from aircraft
- Quantify construction and operating air emissions

Aircraft Noise

- MCB Hawaii Kaneohe Bay
  - Existing aircraft noise at the base, including aircraft overflights (for example, in Kaimalino and Aikahi Park), night operations, engine runups, existing flight tracks.
  - Projected increase in aviation operations, resulting in more aircraft noise.
  - Impacts on residential areas, schools (learning), human health, quality of life (e.g., sleep disturbance), property values.
  - Noise study methodology: no actual noise measurements; needs to characterize single noise events; needs to include cumulative impacts (e.g., P-8As).
- Upolu Airport: impacts on residents' quality of life, quiet rural environment, tourism, agriculture, property values; concern about flight tracks.
- Kalaupapa Airport: aviation operations and noise are incompatible with the National Historic Park.
- Pohakuloa Training Area: impacts on "natural quiet" at Volcanoes National Park in designated wilderness, specifically the Mauna Loa Summit Trail—methodology is not adequate to assess noise impacts to park resources; low-altitude training impacts.

Geology, Soils, Topography

- Soil erosion caused by aircraft downwash, various locations

Drainage, Hydrology, Water Quality

- Impacts on groundwater aquifers, e.g., PTA
- Impacts on impaired water bodies, in particular, SBER and KLOA.
- Commit to compliance with low impact development (LID).
- Impacts on ocean water quality, e.g., Kaneohe Bay and Kailua Bay

Biological Resources

- Bird Aircraft Strike Hazard (BASH), various locations
- Incomplete analysis of biological resources at Upolu Airport
- Humpback whales, Hawaiian monk seals, green sea turtles at Upolu Airport and Kalaupapa Airport
- Wildland fire risk due to MV-22 exhaust
- Findings were based on limited biological surveys.
- The presence of certain species was not documented in the EIS, various locations.

- Impacts on palila critical habitat at PTA.
- Impacts on the endangered Hawaiian hoary bat and Hawaiian goose (nene).
- Aircraft downwash impacts.

Cultural Resources

- Area of potential effect (APE) is too small, various locations.
- Impacts on Mookini Heiau and Kamehameha Birthsite.
- Assess impacts cumulatively.
- Consider spiritual dimension of resources.
- Aircraft downwash impacts.
- Demolition of historic buildings.

Safety and Environmental Health

- Aircraft noise impacts on human health.
- Depleted uranium at PTA.
- Aircraft fuel pollution; concern about fuel transport.
- Aircraft crashes.
- BASH risk.
- Wildland fire risk.

Socioeconomics

- Environmental justice and protection of children (EOs 12898 and 13045); impacts on Native Hawaiian population.
- Housing availability and costs

Infrastructure

- Impact of increased potable water demand and wastewater flows from the new population on existing facilities.
- Concern about increase in wastewater discharge and the August 2010 consent decree.
- Require water conservation fixtures and strategies for new facilities.
- Reuse demolition waste.

Energy Use

- Discuss plans for biofuel use by MV-22 and H-1 aircraft.

Cumulative Impacts

- Greenhouse gas (GHG) emissions:
  - Specify that all new facilities would have net-zero energy use.
  - Maximize renewable energy through use of solar energy and other appropriate technologies.
  - Evaluate GHG emission sources.
- Cumulative impact analysis is not adequate.
- Add information about other actions, e.g., the Pulehunui project on Maui.
- Include noise from other aircraft in the noise analysis.

1.6 RELATED PLANNING EFFORTS

The following planning initiatives, either continuing or completed, may affect the proposed action. They provide context and are considered in the evaluation of alternatives and cumulative impacts in this document. See Chapter 5 for a more complete list of related initiatives considered in the cumulative impacts analysis.

- *U.S. Marine Corps FY2011 Aviation Plan* (September 2010). Published yearly, this document provides an overall strategy and schedule for Marine Corps aviation.
- *Environmental Assessment for Grow the Force, Marine Corps Base Hawaii* (August 2011). This EA analyzes the impacts of stationing additional ground combat forces at Marine Corps Base Hawaii.
- *Hawaii Public/Private Venture Housing Program.* MCB Hawaii entered into a PPV program to privatize a portion of family housing on Oahu through the year 2054 under the Military Housing Privatization Initiative. Housing units continue to be renovated or replaced at MCB Hawaii Kaneohe Bay.
- *U.S. Navy Final EIS for the Introduction of the P-8A Multi-Mission Maritime Aircraft into the U.S. Navy Fleet* (November 2008). The EIS evaluates the impacts of introducing the P-8A Maritime Multimission Aircraft to Hawaii. The P-8A will replace most of the existing P-3C Orion aircraft currently in use by Navy patrol squadrons at MCB Hawaii Kaneohe Bay.
- *Naval Aviation Vision 2032* (January 2010). Similar to the Marine Corps Aviation Plan, the Naval Aviation Vision outlines future Navy aviation plans. This plan describes upgrades to both the P-3C to P-8A and the SH-60 to the MH-60 helicopter.

- *Hawaii Range Complex EIS/OEIS:* In May 2008, the Department of the Navy prepared the Hawaii Range Complex (HRC) Final EIS/Overseas EIS (EIS/OEIS). A Record of Decision (ROD) was signed on June 26, 2008, and a revised ROD was signed on February 26, 2009. In the EIS/OEIS, the Navy proposed to increase the number of training events in HRC, including additional field carrier landing practice, future Research, Development, Testing, and Evaluation programs, and the addition of major exercises, such as supporting three Carrier Strike Groups training at the same time. The activities would take place throughout the Hawaiian Islands with enhancements at PMRF. The proposed enhancements at PMRF included construction of a consolidated range operations complex, Directed Energy Test Center operations building, and equipment upgrades to existing buildings and infrastructure. The EIS included all existing training activities, events, and support activities.
- *Hawaii/Southern California Training and Testing EIS/OEIS:* The Hawaii/Southern California Training and Testing (HSTT) EIS/OEIS, which is currently in progress, will assess the environmental impacts of training and testing activities throughout the in-water portions of the study area (including MV-22 and H-1 operations), which includes areas around the Hawaiian Islands. In addition to reassessing the in-water activities contained in the 2008 HRC EIS, the HSTT EIS/OEIS will adjust baseline training and testing activities from current levels to the levels needed to support Navy requirements beginning in January 2014; analyze potential environmental impacts of training and testing activities in additional areas not covered in previous documents where activities historically occur—including Navy ports, naval shipyards, and the transit channels serving these areas; implement enhanced range capabilities; and update the analysis using the best available science and methods.
- *Hawaii Range Complex Management Plan:* An update of the Hawaii Range Complex Management Plan is in progress. The updated plan will include fixed wing, rotary, and tilt rotor aircraft training activities and capabilities supported by PMRF, including training at the water ranges and Kaula Island. New training activities proposed in the HSTT EIS and MV-22 EIS will be discussed in the updated plan. The updated plan will not include discussion of PMRF airfield operations.
- Draft Programmatic Environmental Impact Statement for Modernization of Training Infrastructure at Pohakuloa Training Area, Hawaii (published October 2011). U.S. Army Garrison, Hawaii (USAG-HI) is evaluating the impacts of modernizing training ranges, training support infrastructure, and training support facilities at PTA, including the cantonment area and Bradshaw Army Airfield (FR October 2011).

- *Army Transformation and Permanent Stationing of the 2/25th Stryker Brigade Combat Team.* In 2004, the Army completed a Final EIS for transformation of the 2nd Brigade, 25th Infantry Division (Light) to a Stryker Brigade Combat Team (SBCT). In 2008, a Final EIS was published for the permanent stationing of the 2/25th SBCT at Schofield Barracks Military Reservation while conducting required training at military training sites in Hawaii.

1.7 APPLICABLE GOVERNMENT PERMITS, CONSULTATIONS, LAWS, AND EXECUTIVE ORDERS

In accordance with CEQ regulations (40 CFR Parts 1500-1508), the Marine Corps has prepared this EIS concurrently with environmental impacts analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (16 USC 661 et seq.), the National Historic Preservation Act (NHPA) of 1966 (16 USC 470 et seq.), the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and other environmental laws, regulations, and Executive Orders (EOs) outlined by environmental resource in Table 1-3. Per 36 CFR 800.8, DoN has integrated the NEPA and NHPA processes, such that public meetings for the DEIS also provided opportunities for NHPA Section 106 input.

Table 1-3. Permits and Consultations

Permits and Consultations	Regulatory Agencies/Consulted Parties
Clean Air Act, as amended (42 USC 7401-7671q) (permits for stationary sources)	State Department of Health (DOH)
Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451-1465) (consistency determination)	State Office of Planning
Consultation in accordance with Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.)	U.S. Fish and Wildlife Service (USFWS)
Consultation in accordance with Section 106 of the National Historic Preservation Act of 1966 (16 USC 470x-6)	State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation (ACHP), Native Hawaiian Organizations (NHO), Historic Hawaii Foundation (HHF), National Trust for Historic Preservation, National Park Service (NPS)
Clean Water Act of 1972 (33 U.S.C. 1251 et seq.) (National Pollutant Discharge Elimination System [NPDES] permit)	State Department of Health (DOH)

The following summarizes results of the ESA Section 7 informal consultation, NHPA Section 106 consultation, and Coastal Zone Management (CZM) consistency determination.

- ESA Section 7 Informal Consultation. DoN completed informal consultation with the U.S. Fish and Wildlife Service (USFWS). In a letter dated February 17, 2012, USFWS concurred with DoN's "no effect" determination for the federally endangered plant species *Stenogyne augustifolia*, and "may affect, but not likely to adversely affect" determinations for the federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) and Hawaiian goose or nene (*Branta sandwicensis*). The DoN's determination for the nene is based on minimization and avoidance measures stated in its consultation letter. Correspondence is presented in Appendix J.
- NHPA Section 106 Consultation. The Marine Corps is in the process of completing the NHPA Section 106 consultation process. A programmatic agreement (PA) documenting the findings and stipulating mitigation has been finalized and is being circulated to the consulting parties for signatures. A signed PA is required before DoN approves the ROD; the signed PA will be made available to the public on the EIS website.
- CZM Consistency Determination. In a letter dated March 6, 2012, the State of Hawaii Office of Planning concurred with the Marine Corps' determination "that the proposed activities are consistent to the maximum extent practicable with the enforceable policies of the Hawaii CZM Program." The Hawaii CZM Program Application for CZM Federal Consistency Review, along with relevant correspondence, are presented in Appendix L.

Key applicable laws and executive orders, in addition to those listed above, include the following:

- Archeological and Historic Data Preservation Act of 1974 (P.L. 93-291; 16 USC 469-469c)
- Archeological Resources Protection Act of 1979 (P.L. 96-95; 16 USC 470aa-470mm)
- Clean Water Act of 1972 (33 USC 1251 et seq.)
- Energy Independence and Security Act of 2007 (P.L. 110-140)
- Federal Aviation Administration Regulation, Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways, Routes, and Reporting Points (14 CFR Part 71)
- Fish and Wildlife Conservation Act of 1980, as amended (16 USC 2901-2911)
- Marine Mammal Protection Act (16 USC 1361-1421h)
- Memorandum For Deputy Chief Of Naval Operations (Fleet Readiness And Logistics) Deputy Commandant of the Marine Corps (Installations And Logistics) on the subject of

Department of the Navy Low Impact Development (LID) Policy for Storm Water Management, 16 November 2007.

- Migratory Bird Treaty Act of 1918, as amended (16 USC 703 et seq.)
- Military Construction Codification Act (10 USC 2801 et seq.)
- Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001 et seq.)
- Noise Control Act of 1972, as amended
- Pollution Prevention Act of 1990 (42 USC 13101-13109)
- Sikes Act Improvement Amendments of 1997 (16 USC 670a-670o)
- EO 11988, *Floodplain Management*, 1977
- EO 11990, *Protection of Wetlands*, 1977
- EO 11991, *Protection and Enhancement of Environmental Quality*, 1977
- EO 12856, *Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements*, 1993
- EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, 1994
- EO 12962, *Recreational Fisheries*, 1995
- EO 13045, *Protection of Children from Environmental Health and Safety Risks,* 1997
- EO 13089, *Coral Reef Protection*, 1998
- EO 13112, *Invasive Species*, 1999
- EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, 2001
- EO 13123, *Greening the Government through Efficient Energy Management*, 1999
- EO 13287, *Preserve America*
- EO 13423, *Strengthening Federal Environmental Energy and Transportation Management,* 2007
- EO 13514, *Federal Leadership in Environmental, Energy and Economic Performance*

1.8 SUMMARY OF REVISIONS TO THE EIS

Public and agency comments on the Draft EIS revealed the need to revise the document to:

(1) change one or more elements of the proposed action and alternatives presented in Chapter 2, which affects the analyses in subsequent chapters;

(2) clarify or enhance certain information to improve the accuracy and thoroughness of the analyses, which may or may not result in altering conclusions regarding the nature or magnitude of impacts;

(3) add information about mitigation and consultations, including measures developed during the NHPA Section 106 and ESA Section 7 consultations; and

(4) correct minor editorial or typographical errors.

The first three items listed above are summarized below.

Changes to Proposed Action and Alternatives

- Changes to Alternatives A and B at MCB Hawaii Kaneohe Bay include demolition of Building 1094 for a parking structure to support the BEQs; alternate site development for MALS warehouses and maintenance; and alternate site development for the replacement of MCCS self storage units. Updated construction costs are reflected in the analysis of economic and fiscal impacts. Appendix G-1, Historic Property Descriptions, has been revised accordingly.
- Upolu Airport is no longer being considered for Confined Area Landings (CALs). Revised Chapter 2 to delete reference to Upolu Airport for CALs. Upolu Airport would be available for routine flight operations, similar to other State airports (described in Section 2.2), and particularly as a diversion airfield in case of emergencies or due to weather conditions at PTA. This type of use would be infrequent. As with other State airports, Upolu may be considered for specific training exercises of set duration, which would require approval by the State Department of Transportation (DOT), Airport Division. With removal of Upolu Airport from the list of tactical training areas, corresponding sections in Chapter 4 have been deleted, and Appendices B-1 and B-2 have been revised.
- MV-22 training activities are no longer being proposed at Kalaupapa Airport. Revised Table 2-5, Aviation Training Locations and Activities, to reflect this change. Also revised the airspace and noise analyses in Sections 4.3.3.6 and 4.5.3, respectively. Revised Appendix D, Noise Modeling Data.
- H-1 training activities are being discussed in continuing NHPA Section 106 consultation, as described in Section 4.9.3.5. For this reason, potential impacts from reallocated aviation training operations being contemplated are evaluated in Section 4.9.3.5.

Clarifications or Enhanced Information

- Section 1.6, Related Planning Efforts. Added information to descriptions of the Hawaii Range Complex EIS and the Hawaii/Southern California Training and Testing EIS/OEIS.
- Proposed Action and Alternatives. Expanded discussion of the squadrons' use of State airports.
- Chapter 3: MCB Hawaii Kaneohe Bay
  - Airspace. Added text to clarify that the No Action Alternative is the projected future baseline. Made comparison between proposed action and No Action Alternative.
  - Air Quality. Added air emissions estimates for construction related and non-aircraft operational activities. Quantification of emissions from these activities does not affect the findings and any mitigation in the analysis.
  - Noise. Added one figure and accompanying text to describe single event noise levels.
  - Hazardous Materials and Waste. Updated status of Installation Restoration Program (IRP) sites at MCB Hawaii Kaneohe Bay.
  - Aircraft Safety. Updated Tables 3-18 and 3-19 with FY11 mishap data. Updated mishap rates in the text.
  - Socioeconomics. Added statement regarding impact of aircraft noise on residential property values. Updated analysis of construction employment and wages and fiscal impacts, based on updated construction costs.
- Chapter 4: Other Training Areas
  - Airspace. .Corrected the estimate of general aviation operations at PTA in Table 4-5. Also corrected Section 4.3.3.3 to reflect this change. Removed Upolu Airport as a tactical LZ. Revised the projected number of operations at Kalaupapa Airport to delete MV-22 training. Redistributed MV-22 operations from Kalaupapa Airport to PTA.
  - Air Quality. Added air emissions estimates for construction related and non-aircraft operational activities. Also revised aircraft activities/events to match those in Section 4.3, Airspace. Quantification and revision of emissions from these activities do not affect the findings and any mitigation in the analysis.
  - Noise. Revised Figures 4.1 and 4.2 to show 50 and 45 DNL contours and to reflect only H-1 operations (no MV-22 operations); also revised text and tables in Section 4.5.3 to explain this change. Added one figure and accompanying text to describe single event noise levels.

  - Cultural Resources. Added text to Section 4.9.2.6 to identify Kalaupapa as a National Historic Landmark. Added text to Section 4.9.3.5 to describe potential impacts of contemplated reallocated aviation training operations from Kalaupapa Airport to other airports.

- Chapter 5: Cumulative Impacts
  - Non-Military Actions. Updated information about the Puunene projects in Section 5.2.2 relevant to the HIARNG facility.
  - Air Quality. Added GHG estimates for construction related and non-aircraft operational activities. Quantification and revision of emissions from these activities do not affect the findings and any mitigation in the analysis.

Mitigation and Consultations

- Added ESA Section 7 documentation to Appendix J and made revisions to section 4.8, Biological Resources, to reflect results of the informal consultation
- Added NHPA Section 106 documentation to Appendix K and made revisions to Sections 3.9 and 4.9, Cultural Resources, to reflect status of the consultation process.
- Added CZM federal consistency determination documentation to Appendix L and made revisions to Section 1.7, Applicable Government Permits, Consultations, Laws, and Executive Orders.
- Made revisions to Chapter 6, Impacts Summary, to incorporate results of the consultations referenced above.

1.9 ORGANIZATION OF THIS DOCUMENT

Chapter 2 describes the Proposed Action and Alternatives in detail, starting with a discussion of the alternatives development process and why certain alternatives were considered but dismissed from further analysis. Next, the three alternatives are described—two action alternatives (A and B) and the No Action Alternative. Proposed basing facilities improvements at MCB Hawaii Kaneohe Bay under each action alternative are described, followed by descriptions of proposed aviation training and proposed aviation training facilities improvements. Required management measures to be incorporated into each action alternative are then discussed, followed by a discussion of how issues and resources were screened to determine which ones warranted more detailed study.

Given the multiple geographic areas to be assessed, including the squadrons' proposed basing location at MCB Hawaii Kaneohe Bay and training facilities located on six islands, the remainder of this document is organized by geographic area, i.e., basing location (MCB Hawaii Kaneohe Bay) and other training areas. For each installation or training area, the discussion is organized by resource or issue area.

Chapter 3 covers the affected environment at MCB Hawaii Kaneohe Bay and environmental consequences resulting from basing and training operations at that installation under the two action alternatives and the No Action Alternative.

Chapter 4 addresses the affected environment and environmental consequences at other training areas proposed for use by the VMM and HMLA squadrons throughout the state, including MCTAB; U.S. Army training facilities on Oahu; PTA on the island of Hawaii; PMRF on the island of Kauai; and facilities on the islands of Molokai and Maui. Potential impacts from the two action alternatives and the No Action Alternative are presented.

Chapter 5 presents the cumulative impacts (local and regional) of the two action alternatives and the No Action Alternative.

Chapter 6 presents a summary of impacts organized by resource area and issue.

Chapter 7 discusses other considerations required by NEPA.

Chapter 8 identifies those involved in preparing the EIS.

Chapter 9 lists references used in preparing the EIS.

Chapter 10 presents the DEIS and FEIS distribution lists.

The appendices include documents associated with the NEPA process, the federal consultations, as well as studies conducted as part of this EIS (including supporting/supplementary information).

CHAPTER 2

Proposed Action and Alternatives

Proposed Action and Alternatives

2.1 INTRODUCTION

This chapter is organized into the following sections. Section 2.2 summarizes the proposed action, Section 2.3 documents the screening process used by the Marine Corps to develop basing alternatives to be evaluated in this Environmental Impact Statement (EIS), and Section 2.4 describes the alternatives, including the No Action Alternative. Alternatives considered but not carried forward for further analysis in this EIS are presented in Section 2.5. Management measures being incorporated into each alternative to avoid or minimize impacts are identified in Section 2.6. The process used to screen issues and resources is described in Section 2.7. The criteria used to evaluate the significance of potential impacts is presented in Section 2.8.

2.2 PROPOSED ACTION

The Marine Corps proposes to: (1) base and operate up to two VMM squadrons and one HMLA squadron to service Marine Corps operations in Hawaii, and (2) conduct aviation training, readiness, and special exercise operations to attain and maintain proficiency in the employment of the MV-22 and H-1 (AH-1 and UH-1) aircraft at statewide training facilities. Demolition, new construction, and renovation are proposed to develop basing facilities for the VMM and HMLA squadrons. Specific activities would include: demolition, renovation and/or construction of hangars and other structures; taxiway and parking apron improvements; construction of additional bachelor enlisted quarters (BEQs); construction of Marine Aviation Group 24 (MAG-24) headquarters and parking structure; and expansion of Marine Aviation Logistics Squadron 24 (MALS-24) aircraft maintenance facilities. Existing facilities would be used to the extent possible.

Aviation training, including administrative operations and tactical operations, may occur at the existing facilities listed below and in Table 2-3 (see page 2-21).

- Marine Corps Base (MCB) Hawaii Kaneohe Bay, island of Oahu. Owner: U.S. Government under Marine Corps control.
- Marine Corps Training Area Bellows (MCTAB), Waimanalo, island of Oahu. Owner: U.S. Government under Marine Corps control.
- U.S. Army training areas at Schofield Barracks East Range (SBER) (owner: U.S. Government under Army control), Kahuku Training Area (KTA) (U.S. Government under Army control by ownership and land leases), and Kawailoa Training Area (KLOA) (owner: State and private), island of Oahu.[1]

[1] Privately-owned land at KTA and KLOA are leased by the Army.

- Dillingham Military Reservation (DMR), Mokuleia, island of Oahu. Owner: U.S. Government under Army control.
- Pohakuloa Training Area (PTA), island of Hawaii. Owner: U.S. Government under Army control by ownership and land leases.
- Pacific Missile Range Facility (PMRF), Barking Sands, island of Kauai. Owner: U.S. Government under Navy control or lease.
- Molokai Training Support Facility (MTSF), island of Molokai. Owner: U.S. Government under Marine Corps control.
- Kalaupapa Airport, island of Molokai. Owner: State of Hawaii.[2]
- Hawaii Army National Guard (HIARNG) Facility, Puunene, island of Maui. Owner: State of Hawaii.

Other airfields in Hawaii proposed for VMM and HMLA aviation use would include those operated by the State of Hawaii (State) Department of Transportation (DOT), Airports Division. The state airports are public airports open to and for public use, without prior permission, without restrictions, and within the physical capacities of the available facilities. DOT, Airports Division, obtains funding (grants) for airport improvements through the Federal Aviation Administration (FAA) in the Airport Improvement Program (AIP), as described in the National Plan of Integrated Airport Systems (NPIAS) (49 U.S.C. Section 47103). As such, DOT, Airports Division, is required to provide grant assurances on the operation of the airports and the use of the grant funds (Title 49, U.S.C., subtitle VII, as amended). Grant 27 requires the sponsor (DOT, Airports Division) to make available all of the facilities of an airport developed with Federal financial assistance and all those usable for landing and takeoff of aircraft to the United States for use by Government aircraft in common with other aircraft at all times.

State airports are used by existing Marine Corps aviation squadrons for routine flight operations, refueling, and similar activities, coordinating with civilian airport authorities in accordance with FAA procedures, and would be similarly used by the proposed VMM and HMLA squadrons. In addition, the Marine Corps may occasionally conduct specific aviation training exercises at selected airports with permission from DOT, Airports Division. State airports include: Lihue and Port Allen Airports on the island of Kauai; Lanai Airport on the island of Lanai; Hana and Kahului Airports on the island of Maui; Molokai and Kalaupapa Airports on the island of Molokai; Hilo International, Kona International, Upolu, and Waimea-

[2] Any new use at Kalaupapa Airport under this proposed action will be determined through the NHPA Section 106 consultation process.

Kohala Airports on the island of Hawaii; and Honolulu International, Dillingham, and Kalaeloa Airports on the island of Oahu.

In addition, aviation facilities on the island of Oahu at Wheeler Army Airfield, operated by the U.S. Army, and Joint Base Pearl Harbor-Hickam, operated by the U.S. Navy and Air Force, are available for VMM and HMLA use. As these airfields would be used for routine flight operations, their use is not analyzed in this document.

Based on Headquarters Marine Corps projections, personnel increases would occur from FY2012 through FY2018, in phase with the delivery of the aircraft. Construction would be phased over six to ten years. For EIS purposes, the planning horizon used to analyze the proposed action is the year 2018, and the 2009 is generally used as the baseline year to describe the existing environmental conditions.

2.3 ALTERNATIVES DEVELOPMENT PROCESS

Following is a summary of the screening process used to develop the Hawaii basing alternatives evaluated in this EIS. As stated in Chapter 1, the purpose of the proposed action is to ensure that the Marine Air-Ground Task Force (MAGTF) is capable of supporting Third Marine Expeditionary Force (III MEF) requirements in Hawaii, and the need for the proposed action is to eliminate existing deficiencies of the MAGTF in Hawaii. Accordingly, basing of the squadrons outside of Hawaii would not be considered reasonable and the screening process focused on Hawaii basing alternatives.

Using operational requirements as selection criteria, the screening process was applied to narrow various Hawaii basing alternatives for the VMM and HMLA squadrons to a range of reasonable alternatives to be evaluated in the EIS. As a result of the screening process, MCB Hawaii Kaneohe Bay was determined to be the only site meeting all criteria and thus carried forward for further study in this EIS. Section 2.3.1 describes how the basing locations were evaluated and how MCB Hawaii Kaneohe Bay was ultimately selected. Section 2.4 presents the aviation facility alternatives at MCB Hawaii Kaneohe Bay.

2.3.1 SCREENING CRITERIA

Basing alternatives were evaluated against specific screening criteria to ensure that all analyzed alternatives met minimum operational requirements. Established by the U.S. Marine Corps (USMC) Deputy Commandant for Aviation (DCA), these operational requirements are consistent with those applied to other existing and planned Marine Corps tiltrotor and rotary-wing basing locations in the continental U.S. and overseas.[3] In order to base the VMM and HMLA squadrons in Hawaii, the following operational requirements are considered to be critical: (1) ability to globally deploy for contingency operations, training exercises, and humanitarian and disaster relief operations; (2) ability to locally deploy for training and operations; and (3) sufficient existing infrastructure or space to construct required infrastructure such as hangars, aircraft parking aprons, aviation simulators, BEQs, and other airfield-related facilities needed to base the squadrons.

Only existing Department of Defense (DoD) aviation installations were considered as basing alternatives for the following reasons: using a non-DoD facility would potentially involve either land acquisition or long-term lease and, in the case of a lease, development of extensive improvements on land owned by others; and using a non-aviation facility is not an option, given the need for an airfield that meets the squadrons' operational requirements (see Screening Criterion 2, as follows).

Given these three operational requirements, the basing locations were screened using the following criteria:

Screening Criterion 1: Accessibility to Airfields and Seaports Supporting Global Deployment

All operational Marine Corps units must have the ability to be globally deployed. The ability to be globally deployed refers to the deployment of aircraft, personnel, and required ground support equipment and logistical support (parts, cranes, ammunition, etc.) by means of strategic airlift or global sealift. To meet this requirement, the basing location for the VMM and HMLA squadrons must have immediate access, via ground transportation, to an airfield that supports strategic airlift (e.g., C-5, AN-124, and C-17 aircraft) and a seaport that can support global sealift ships.

Selection Criterion 2: Local Training Area Proximity and Airfield Requirements

All operational Marine Corps units must have the ability to locally deploy for training and operations. The ability to locally deploy means that units must be based within specific proximity, 65 nautical miles (NM) (120 kilometers [km]), to training areas typically used by the supported units of the MAGTF—the Ground Combat Element (GCE) and Logistics Combat Element (LCE). These elements are based at MCB Hawaii and conduct a majority of their

[3] Selection criteria used to assess proposed alternative facilities/installations against requirements for a replacement or new facility/installation were derived from *USMC Requirements Document* (March 2010).

training on the island of Oahu at MCB Hawaii Kaneohe Bay and MCTAB. Furthermore, the airfield base must meet certain requirements, as described below.

Training Area Proximity Requirements. Because the VMM and HMLA squadrons would routinely train and operate with infantry and logistics forces (GCE and LCE), the aviation squadrons must be based within range of training areas routinely used by the GCE (MCB Hawaii Kaneohe Bay and MCTAB) and associated LCE. The maximum range between the basing location for aviation squadrons and the training areas routinely used by the GCE and LCE is 65 NM (120 km) based on the following rationale. To complete a training exercise effectively, a VMM or HMLA squadron must reach the training location, spend no less than 50 percent of its useable flight time to actually perform its primary mission, and then return to base. The maximum distance that can be traveled between the basing location and the training location is determined by the fuel capacity and speed of the slowest aircraft routinely participating in the exercise—in this instance, that aircraft is the AH-1 Cobra. The AH-1, flying at 130 knots indicated air speed (KIAS) (240 kilometers per hour [kph]), has two hours of flying time. This allows it to fly for up to 30 minutes to get to the training area, conduct its mission for one hour, and then return to base in 30 minutes flying time. At 130 KIAS (240 kph), the AH-1 can fly 65 NM (120 km) in 30 minutes. Accordingly, the distance between the basing location and the routinely used GCE training areas (MCB Hawaii Kaneohe Bay and MCTAB) must be 65 NM (120 km) or less. Although the 65-NM requirement is based upon proximity to supported units and their primary training areas, H-1 aircraft are not precluded from conducting aircrew training beyond 65 NM where range and time on station can be extended by either an intermediate fueling location or fuel at the destinations. For this reason, fueling capabilities of loaded but unarmed aircraft are being further evaluated at MTSF on Molokai and the HIARNG Facility on Maui, as well as selected FARP sites at PTA.

Airfield Requirements. The basing location for the VMM and HMLA squadrons must have an existing airfield that meets the following requirements, or an airfield that can be improved to meet these requirements by 2012, when the first contingent of aircraft and personnel are expected to arrive.

- *Night training.* Marine Corps helicopter pilots must satisfy night training requirements. The airfield and airfield environment at the basing location must be able to support night operations, to include use of night vision devices.
- *Instrument procedures.* Marine Corps helicopter pilots must remain current on instrument procedures, to include precision and non-precision instrument approaches.

- Because the aircraft need to return to the airfield under instrument conditions, any basing location must normally have the capability to support *two* precision instrument approaches, from roughly opposite directions to make them usable and appropriate for all wind directions; a precision approach glide slope between 3 to 3.5 degrees; and an azimuth aligned with the runway ±10 degrees.
- The airfield environment at the basing location needs to be sufficiently clear of obstacles along both approach corridors, and within Naval Air Systems Command (NAVAIR) safety standards for circling minimums.

- *Local runway pattern work.* The basing location needs to have an airfield that can support day and night air traffic operations, for altitudes up to at least 1,500 feet (ft) (457 meters [m]) above ground level (AGL).
- *Runway and overrun lengths.* The basing location needs to have a runway and overruns that are sufficiently long so that pilots and aircraft based at the airfield can return and safely land in an emergency with one engine inoperative. For the MV-22B, the airfield must be at least 5,039 ft (1,536 m) long, with two 1,000-ft (305-m) overruns, for a total minimum length of 7,041 ft (2,146 m).
- *Mission compatibility*. Existing uses at the selected DoD airfield must be compatible with the mission of the VMM and HMLA squadrons, and the VMM and HMLA squadrons' missions must be compatible with the existing mission of the airfield, as determined by the DoD component that operates the facility.

Screening Criterion 3: Facility Capacity

The basing location for the VMM and HMLA squadrons must be capable of permanently basing these aircraft and associated command and support infrastructure. It must have sufficient capacity—either existing facilities and infrastructure or space available to construct required facilities and infrastructure. The use of existing facilities is preferred.

An estimated 2 million square feet (SF) (186,000 square meters [SM]) are required to accommodate infrastructure for the VMM and HMLA squadrons.[4] This spatial requirement considers hangars, aircraft parking aprons, and other airfield-related facilities and includes approximately 1,200,000 SF (111,000 SM) for the VMM squadrons and 620,000 SF (57,600 SM) for the HMLA squadron. It also includes approximately 267,000 SF (24,805 SM) for BEQs and space for vans to house MALS-24 satellite facilities for the squadrons.

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[4] Sources: Basic Facility Requirements (BFRs) prepared for the Plus-up Development Study (Draft June 2010) and SF1391 MILCON documents prepared for the aviation-related facilities at MCB Hawaii Kaneohe Bay.

2.3.2 ALTERNATIVES ANALYSIS

The following discussion outlines how the DoN applied the screening criteria to identify reasonable alternatives for basing locations to be carried forward for analysis in the EIS. See Figure 2-1 for a map of potential basing locations in the Hawaiian Islands.

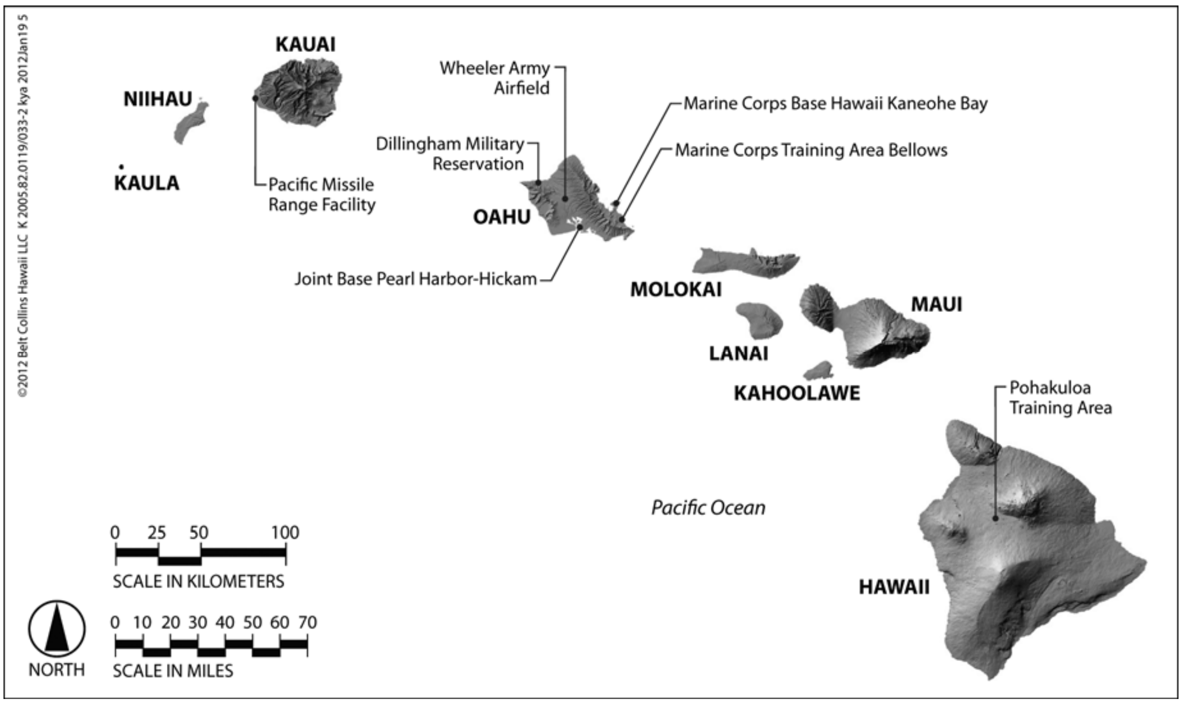

Figure 2-1. Potential Basing Locations in Hawaii

Screening Criterion 1: Accessibility to Airfields and Seaports Supporting Global Deployment

The only airfields and the sole seaport capable of supporting global deployment are located on the island of Oahu. Therefore, basing alternatives are limited to Oahu. DoD aviation installations on Oahu that can support global deployment are MCB Hawaii Kaneohe Bay, Joint Base Pearl Harbor-Hickam, and Wheeler Army Airfield. Only one seaport on Oahu—Pearl Harbor—is capable of supporting global deployment. In addition, airfields within relatively close proximity via ground transportation to the three DoD aviation installations supporting global deployment were considered. For this reason, MCTAB and Dillingham were moved forward for further consideration.

Screening Criterion 2: Local Training Area Proximity and Airfield Requirements

All five of the installations carried forward from Criterion 1 are within the 65-NM (120-km) radius of training areas routinely used by the GCE and LCE (MCB Hawaii Kaneohe Bay and MCTAB). Figure 2-2 illustrates these relationships. Of these five installations, only two met airfield requirements, as discussed below.

- MCB Hawaii Kaneohe Bay meets the airfield requirements.
- MCTAB currently lacks an operational airfield with sufficient runway/overrun length. Extension of the runway would be constrained by existing buildings (Hawaii Army National Guard facility and Building 701) and known subsurface archaeological deposits. MCTAB's approach is also inhibited by the surrounding mountainous terrain and, hence, would not be suitable for precision instrument approaches.[5]
- Dillingham Airfield does not meet the airfield requirements. The airfield has one 5,000-ft (1,500-m) runway and does not meet the MV-22 airfield requirements for instrument procedures. An entirely new airfield, including runway and taxiways, would have to be constructed to meet DoD regulations (UFC 2008). The aviation safety zones (clear zones, accident potential zones [APZ], and transitional surfaces) of a Class A runway required for the MV-22 would extend beyond the airport boundaries, including over private residential lands and Farrington Highway. Land acquisitions, leases, and/or easements would be required to keep the safety zones on DoD owned or leased property.
- Joint Base Pearl Harbor-Hickam (JBPHH) does not meet the airfield requirements. The airfield at JBPHH is shared with Honolulu International Airport, operated by the State of Hawaii Department of Transportation. FAA staff concluded that basing the MV-22 aircraft at JBPHH would have negative impacts on the flow of air traffic at Honolulu International Airport, and that the MV-22 operations have the potential to create substantial delays, severely restricting the flow of air traffic into and out of the airport and inflicting economic burdens on other airport users. These conclusions are derived from the experience of having 12 AV-8 Harrier aircraft based at JBPHH for about a month during the past year. (The Harrier and Osprey both have vertical hover, take-off, and landing capability.)[6]
- Wheeler Army Airfield meets the airfield requirements.

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5 In addition to being screened out due to airfield deficiencies, MCTAB also lacks available space for facilities expansion. The squadron's facilities and operations would encroach on ground training, the primary mission at Bellows.

6 Yamada, Brian, FAA Support Specialist, Honolulu Control Facility, Personal communication. September 27, 2011; confirmed in letter from Ronnie V. Simpson, Manager, FAA Airports District Office, March 22, 2012.

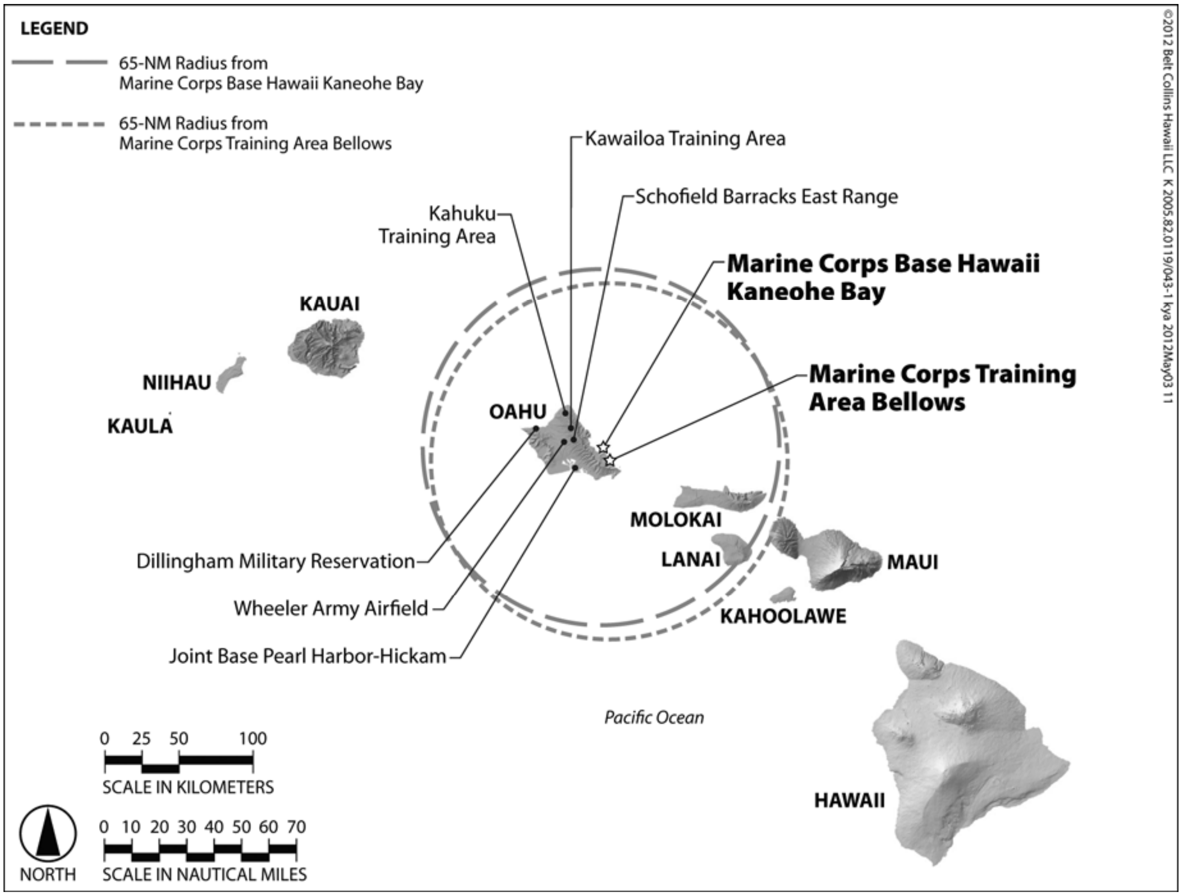

Figure 2-2. 65-NM Distance From MCB Hawaii Kaneohe Bay and MCTAB

After application of Screening Criterion 2, possible basing locations are MCB Hawaii Kaneohe Bay and Wheeler Army Airfield. MCTAB, Joint Base Pearl Harbor-Hickam, and Dillingham Airfield were eliminated from further consideration due to airfield deficiencies.

Screening Criterion 3: Facility Capacity

Of the installations remaining after applying Screening Criterion 2, only one installation met the facility capacity requirement, as described below.

- MCB Hawaii Kaneohe Bay meets the facility capacity requirement. The base has sufficient existing facility capacity or space available for construction/expansion to meet facility needs.

- Wheeler Army Airfield (WAAF) does not meet the facility capacity requirement. The U.S. Army Garrison Hawaii (USAG-HI) Director of Public Works analyzed the land inventory at WAAF and concluded that with future modernization of its facilities over the next five to seven years, as well as planned re-utilization of existing facilities, the Army is unable to station Marine Corps assets at Wheeler. The Director of Public Works coordinated with the 25th Combat Aviation Brigade (CAB), which concurs that the Marine Corps basing would be too constraining.[7]

After application of Screening Criterion 3, MCB Hawaii Kaneohe Bay is the only remaining potential basing location. Table 2-1 summarizes the site selection process.

Table 2-1. Summary of Site Screening Process for Hawaii Basing Locations

Base	Screening Criterion 1 Accessibility to Airfields and Seaports Supporting Global Deployment	Screening Criterion 2 Local Training Area Proximity and Airfield Requirements	Screening Criterion 3 Capacity
MCB Hawaii Kaneohe Bay	Yes	Yes	Yes
MCTAB	Yes	No[1]	—
Wheeler AAF	Yes	Yes	No[2]
Dillingham Military Reservation	Yes	No[1]	—
Joint Base Pearl Harbor-Hickam	Yes	No[3]	—
PTA	No[4]	—	—
PMRF	No[4]	—	—

Notes
— Not evaluated; eliminated in previous criterion.
1 Could meet physical runway, but issues with imaginary surfaces.
2 No capacity (USAG-HI Director of Public Works, July 18, 2001).
3 Negative air traffic impacts (FAA Honolulu Control Facility, September 27, 2011).
4 Not accessible to airfields and seaports

[7] Eastwood, Robert. (Director of Public Works, USAG-HI) Personal communication. July 18, 2011.

2.4 PROPOSED ALTERNATIVES

2.4.1 INTRODUCTION

Once the basing location was narrowed down to MCB Hawaii Kaneohe Bay, the Marine Corps developed two facility layout alternatives to accommodate the basing of the VMM and HMLA squadrons at MCB Hawaii Kaneohe Bay. The following elements would be the same and accommodated under both alternatives: personnel (numbers and types), facilities (types) improvements, training area improvements, and training operations (types and tempos).

Personnel

Each alternative would introduce approximately 1,000 active-duty personnel, 22 civilian personnel (contractors and government employees), and 1,106 dependents associated with the VMM and HMLA squadrons. These personnel increases would occur from Fiscal Year (FY) 2012 through FY 2018, in phase with delivery of the aircraft.

Facilities Improvements

Aviation facilities would be constructed to accommodate two VMM squadrons and one HMLA squadron. Each facility alternative was developed to meet the following criteria:

- Provide adequate ramp and hangar space, support facilities, and buildings to accommodate aircraft and personnel, as defined in Section 2.3.1 above.
- Use existing facilities to the greatest extent practicable.
- Place certain facilities in proximity or adjacent to each other to maximize efficiency.
- Avoid or minimize impacts on important natural and cultural resources.
- Avoid conflicts with manmade constraints, e.g., airfield safety clearances and Explosive Safety Quantity Distance (ESQD) arcs associated with ordnance operations.
- Allow for phasing of construction to assure uninterrupted operations.

Several of the proposed projects would involve demolition of existing structures, including structures eligible for listing in the National Register of Historic Places (NRHP). One of the differences between Alternatives A and B is the number of NRHP-eligible BEQs proposed for demolition. Another difference between Alternative A and Alternative B would be the location of VMM facilities at MCB Hawaii Kaneohe Bay. Alternative B calls for locating the facilities on the northwest side of the runway, and includes construction of a runway underpass for access.

Management measures designed to avoid or minimize impacts (for example, BMPs to comply with regulatory requirements during construction) would be incorporated (see Section 2.5). Construction would take approximately six to ten years to complete.

Training Area Improvements

Outside of MCB Hawaii Kaneohe Bay, improvements would be needed to support VMM and HMLA training. Existing landing zones (LZs)[8] at MCTAB and PTA would be upgraded. MTSF would be reactivated and improved, including clearing, grubbing, grading, possibly paving, and fencing. No construction activities are planned at the other training areas. Facility improvements at the training areas outside of MCB Hawaii Kaneohe Bay would be the same, regardless of which facility alternative is selected for MCB Hawaii Kaneohe Bay.

Management measures designed to avoid or minimize impacts during construction would be incorporated (see Section 2.5).

Training Operations

Existing training facilities located statewide would be used by the VMM and HMLA squadrons for training and readiness operations and special exercise operations, regardless of the facility alternative selected for MCB Hawaii Kaneohe Bay.

2.4.2 ALTERNATIVE A

Alternative A (Figure 2-3) would accommodate all of the aviation facilities on the south side of the MCAS Kaneohe Bay runway, with the two VMM squadrons located at the northeast end of the runway. Alternative A is considered optimal, with space available for all existing and projected squadrons/aircraft and for phasing during construction to assure uninterrupted operations.

2.4.2.1 Facilities Improvements at MCB Hawaii Kaneohe Bay

Facility improvements for aircraft and personnel are described using the following categories: aircraft maintenance, operations and training, and base support.

Aircraft Maintenance Facilities. Aircraft maintenance facility layouts for the proposed VMM and HMLA are illustrated in Figure 2-4 and Figure 2-5, respectively. Figure 2-3 shows the MALS-24 layout (area north of Hangars 101 to 103).

8 An LZ is defined as an unprepared area which rotorcraft can land on. Within each LZ, there potentially could be more than one specific landing point for an individual aircraft to land at.

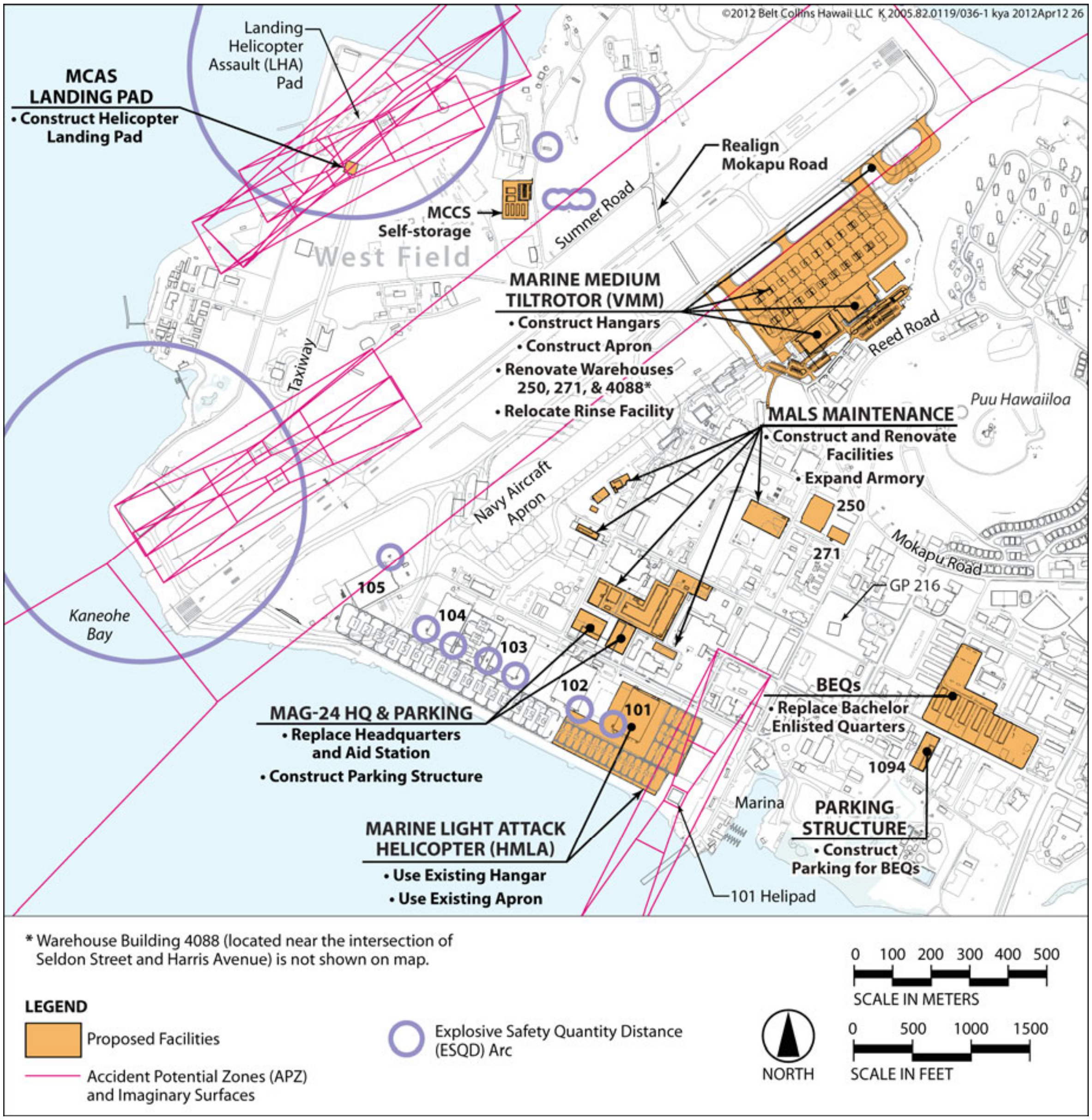

Figure 2-3. Alternative A –Overview, MCB Hawaii Kaneohe Bay

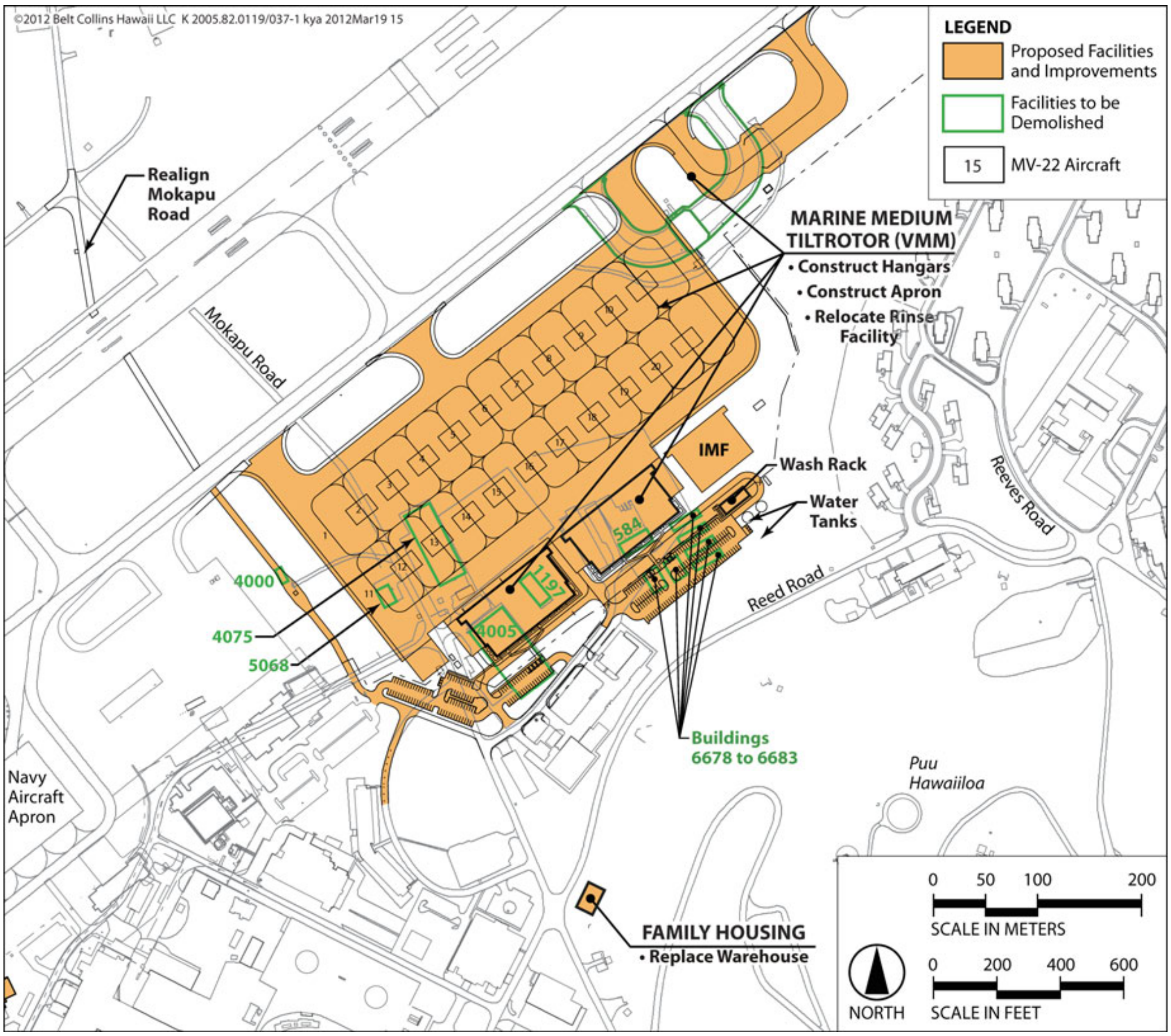

Figure 2-4. Alternative A - VMM Hangar and Apron, MCB Hawaii Kaneohe Bay

Under Alternative A, two hangars and required aprons (aircraft parking areas) would be constructed on the southeast side of the runway to support the two VMM squadrons. A new water tank and Aqueous Fire Foam Film (AFFF) fire suppression system and underground containment facilities would be built near the hangar. An intermediate maintenance facility (IMF) would be built adjacent to the new hangars, and a washrack for the MV-22 aircraft would be built adjacent to the apron.

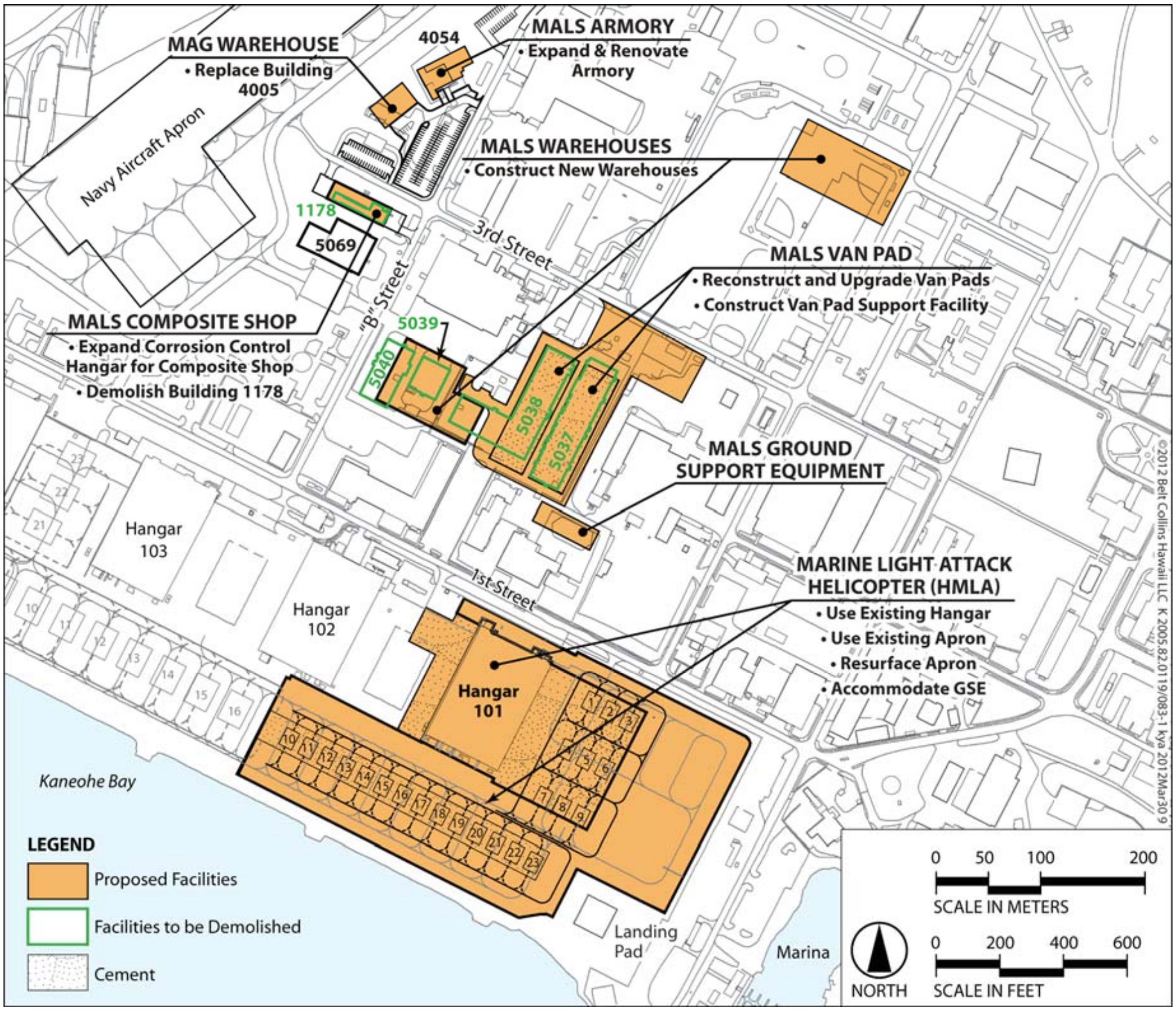

Figure 2-5. Alternative A - HMLA Hangar and Apron and MALS-24 Facilities, MCB Hawaii Kaneohe Bay

In order to construct the necessary facilities, existing facilities on the site would be demolished, as shown in Figure 2-4. New facilities would be constructed and existing facilities would be renovated to house the functions displaced by the necessary demolition. These include warehouse buildings for the Consolidated Issue Facility (CIF), Building 4075; MAG-24, Building 4005; MCB Hawaii Family Housing Department, Building 4005; and Marine Corps Community Services (MCCS) self-storage, Buildings 6678 through 6683. The CIF would relocate into an existing, underutilized warehouse (Building 4088) closer to the BEQs. Warehouses (Buildings 4088, 250 and 271) would be renovated to accommodate the warehouse requirement. The MAG-24 warehouse would be replaced near the existing armory (Building 4054). The other warehouse would be replaced with a warehouse along Reed Road or along G Street. The MCCS self-storage facilities would be replaced in the West Field area. The aircraft rinse facility used by Navy aviation units and presently located at the proposed VMM hangar and apron site would be relocated to the northeast of its existing site.

The HMLA squadron requires one hangar housing four aircraft and an apron sized for 23 aircraft. Existing Hangar 101 and the adjacent apron (Figure 2-5) would support these requirements. Hangar 101, five seaplane ramps, and the adjacent apron are a National Historic Landmark. No renovations or construction are proposed for the seaplane ramps. Proposed renovations for Hangar 101 include demolition and retrofit of existing interior space to better meet functional requirements and to modernize mechanical, information, and electrical systems. The renovation would require installation of an AFFF fire suppression system, including containment facilities on the exterior of the hangar and trenching of the hangar floor.

MALS-24 is responsible for logistic support and intermediate maintenance[9] of aircraft assigned to the MAG-24 squadrons, which involves repairs and storage of aircraft parts. Existing MALS-24 facilities would be renovated or expanded to accommodate the demands of additional aircraft platforms (Figure 2-5). A new supply warehouse would be constructed near the existing maintenance shops to expand the warehouse capacity. In order to accommodate a new warehouse, the required mobile maintenance facilities (commonly known as vans)[10] would be consolidated into an area near the maintenance shops. The vans would require new concrete pads with grounded electrical utilities (commonly known as van pads), since existing van pads could not support increased electrical demands. The composite components[11] shop would be expanded and located near the existing corrosion control hangar (Building 5069). Since the existing engine test cell facility (Building 1178) is not needed by MALS-24, it would be demolished to clear the site for the composite repair facility. A storage area for ground support equipment (GSE) associated with the HMLA aircraft[12]

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[9] Typical intermediate maintenance functions include repair, maintenance, and storage of engines, aircraft structural and hydraulic components, avionics and electrical systems, life safety systems such as rafts or flotation devices, ground support equipment including tows and tractors, and weapons.

[10] Mobile Maintenance Facilities (MMF) or vans are deployed with the MAG to support various missions. The MALS uses vans to support the home based squadrons, just as they would if they were deployed.

[11] Composite components, such as helicopter rotary blades, are made from a unique compound material that requires a separate area for maintenance and repairs.

[12] The H-1 aircraft are equipped with skids, which means that ground support equipment must be used to tow the aircraft while on the ground.

would be accommodated at Hangar 101 and expanded near the existing ground support equipment compound north of 1st Street near the van pads.

In addition to the functions described, MALS-24 is responsible for the housing of all aircraft weapons for the MAG-24 squadrons, as well as personnel training weapons such as rifles and handguns. The H-1 and MV-22 aircraft utilize multiple aircraft weapon systems for each aircraft. With this increase in aircraft weapons and the additional personnel, the existing armory (Building 4054) would be expanded and reconfigured to accommodate the additional weapons (Figure 2-5).

The Marine Corps has determined that new construction and major renovation of its facilities offer the best opportunity to incorporate renewable power generation measures.[13] Accordingly, new buildings and major renovations involving complete roof replacements proposed in this EIS would incorporate roof-top solar thermal and/or photovoltaic technologies. This requirement would also apply to operational and training facilities and base support facilities described below, as appropriate.

Operational and Training Facilities. MAG-24 provides operational support and training to aviation squadrons. With the increase in personnel and aircraft, additional administrative, medical, and training facilities would be required for the VMM and HMLA squadrons.

Alternative A would replace the existing MAG-24 headquarters (HQ) and aid station (Figure 2-6). The new facility would include administrative offices for the projected increase of MAG-24 personnel, as well as an aid station for the MAG-24 and flightline medical response. In order to replace the MAG-24 HQ and aid station, historic Building 301 would be demolished. Additionally, a parking structure would be constructed to provide vehicle parking for MAG-24 HQ personnel, including those from the new squadrons.

Base Support Facilities. Base support facilities for the new squadrons include new bachelor quarters and an additional helicopter landing pad.

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[13] Commandant of the Marine Corps letter, "Roofing System Design and Construction for MILCON Building Projects and Major FSRM Roof Replacements," Change 1, March 3, 2010. This requirement may be waived under certain circumstances, e.g., mission or operational impacts or historic preservation requirements. Energy Star reflective roof products are also required unless exorbitantly price prohibitive or not technically feasible.

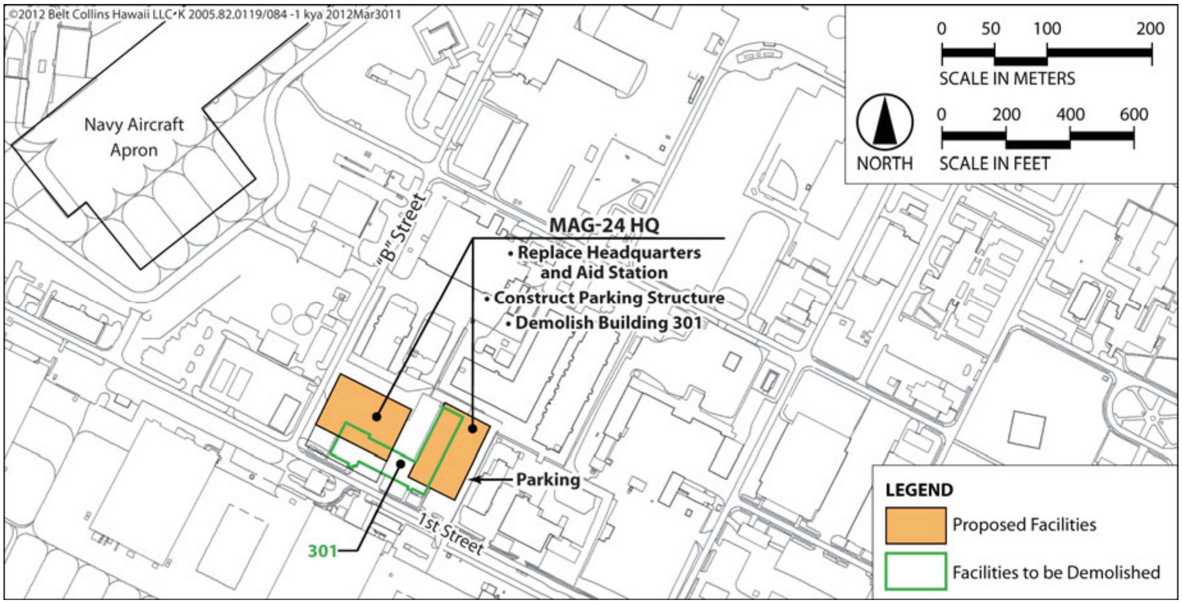

Figure 2-6. Alternative A - MAG-24 Headquarters, MCB Hawaii Kaneohe Bay

Additional bachelor housing and other support facilities are required for the increase in personnel (Figure 2-7). New BEQs are proposed. Three four-story buildings would provide approximately 304 rooms, each room accommodating one or two persons depending on rank. The new buildings would replace the existing BEQ Buildings 225, 226, 227, 228, 229, and 230. These six buildings, eligible for listing in the NRHP, would be demolished. The existing BEQs are very old, difficult to maintain, and do not provide a good quality of life for occupants. Furthermore, they are not energy efficient. These facilities currently provide 168 rooms with two to four people assigned to each room; the Marine Corps campaign plan[14] directs that two bachelors be assigned in each room. In addition, the chilled water plant (Building 3000) and associated covered walkways on the site would be demolished to make way for the new buildings. Building 1094 would be demolished to clear a site for a multi-story parking structure across the street from the BEQs. Improvements would be made to the existing parking lot located north of the BEQs.

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[14] The 2+0 room assignment standard from the Bachelor Enlisted Quarters (BEQ) Campaign Plan (HQMC 2006) would be followed. This standard provides the following: for E1 to E3 (Private to Lance Corporal) 90 net square feet per person, not more than 2 per room and bath shared with no more than 3 others; for E4 to E5 (Corporal to Sergeant) 180 net square feet per person, private room and both shared with not more than 1 other; and for E6 to E9 (Staff Sergeant to Sergeant Major) 270 net square feet per person, private room and bath.

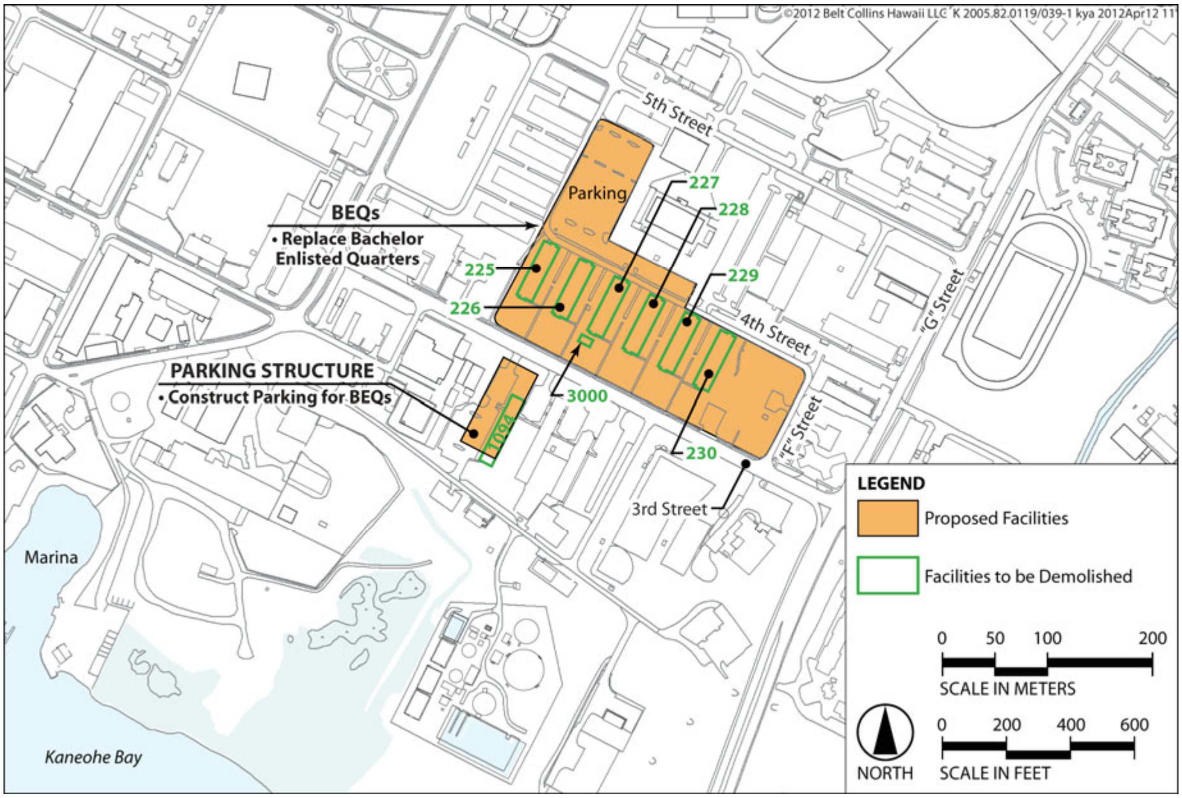


Figure 2-7. Alternative A - Bachelor Enlisted Quarters, MCB Hawaii Kaneohe Bay

For the Marine Corps Air Station (MCAS) to accommodate the increase in flight operations, an additional helicopter landing pad would be constructed at West Field, connected to the existing taxiway (Figure 2-3). The reinforced concrete landing pad would be built to standards for MV-22 aircraft. Table 2-2 summarizes the Alternative A facilities improvements proposed at MCB Hawaii Kaneohe Bay.

Table 2-2. Alternative A: Facilities Improvements

Facility	Location	Improvements (Building Number)	Approximate Scope
VMM hangar and apron	Northeast of runway	Realign Mokapu Road	2,300 ft
		Demolish warehouses and storage facilities (4005, 4075, 4000, 584, 1197, 5068, 6678, 6679, 6680, 6681, 6682, and 6683)	-94,300 SF
		Renovate warehouses (4088, 250, and 271)	100,400 SF

Table 2-2. Alternative A: Facilities Improvements

Facility	Location	Improvements (Building Number)	Approximate Scope
		Replace/relocate CIF warehouse (4075)	38,500 SF
		Replace MAG-24 warehouse (4005)	10,000 SF
		Replace family housing and operations warehouse (4005 and 4000)	15,000 SF
		Replace MCCS self-storage facilities (6678, 6679, 6680, 6681, 6682, and 6683)	16,000 SF
		Construct hangar and IMF	144,000 SF
		Construct apron, wash rack, and taxiway	110,600 SY
		Relocate aircraft rinse facility	9,300 SY
HMLA hangar and apron	Hangar 101	Renovate Hangar 101	117,800 SF
		Resurface and reseal aprons for HMLA	31,100 SY
MALS-24 maintenance shops, warehouse, and armory	MALS-24 maintenance area	Demolish engine test cell near the corrosion control hangar (1178)	-2,700 SF
		Expand composite shop at corrosion control hangar (5069)	11,400 SF
		Demolish van pads (5049, 5050, 5053, 5064)	-13,100 SY
		Construct new van pads	12,700 SY
		Construct MALS-24 warehouse	57,700 SF
		Expand armory (4054)	11,700 SF
MAG-24 HQ	301	Demolish MAG-24 HQ (301)	-35,000 SF
		Construct MAG-24 HQ	44,500 SF
		Construct parking structure	21,100 SY
MCAS helicopter landing pad	West Field	Construct helicopter landing pad for MV-22	1,111 SY
Bachelor housing	3rd Street	Demolish existing BEQs (225, 226, 227, 228, 229, and 230) and associated structures (3000, 1001 to 1006)	-102,300 SF
		Replace with three four-story BEQs	181,700 SF
		Demolish existing building (B1094) for parking structure	21,000 SF
		Construct parking structure	17,500 SY
		Improve existing parking lot	10,700 SY

2.4.2.2 Aviation Training

Proposed aviation training considered in this EIS would be the same under Alternatives A and B. As shown in Table 2-3, tactical training would occur at military installations and ranges, as well as non-military sites. Additional areas would be used only occasionally for emergency or special purposes, such as VIP transport, or medical evacuations (referred to as administrative uses) and include DoD airfields and helipads, such as Ford Island helipad, Camp Smith helipad, Puuloa Bravo range LZ, Wheeler Army Airfield, and the HIARNG facility on Maui. Tactical training and administrative landing areas proposed for use, along with associated airspace boundaries, are identified in Figure 2-8 through Figure 2-13. Aerial images of landing areas are presented in Appendix B-2. All of the areas are currently used or have been used for aviation training by the Marine Corps, Army, and other DoD services.

Administrative LZ. *An LZ that is used occasionally for emergency or special purposes, such as VIP transport or medical evacuations.*

Tactical LZ. *An LZ that is used routinely for training activities, such as confined area landings (CALs) and insert/extract.*

Table 2-3. Proposed Areas/Facilities For Tactical Aviation Training

Island	Owner	Site	Description	LZ/DZ/Helipad/ Airfield[1]
Oahu	U.S. Government under Marine Corps control	MCB Hawaii Kaneohe Bay	MCB Hawaii Kaneohe Bay is the main base for MCB Hawaii. The 2,951-acre (ac) (1,194.22-hectare [ha]) site is located at Mokapu Peninsula on the windward side of Oahu. MCAS Kaneohe Bay, located within MCB Hawaii Kaneohe Bay, provides support services—such as airfield maintenance, air traffic control, maintenance and training facilities—to all aviation activities that occur within MCB Hawaii.	LZ Boondocker
		MCTAB	MCTAB is part of MCB Hawaii. The 1,074-ac (434.6-ha) site is located in Waimanalo on the windward side of Oahu. MCTAB provides training lands for both aviation and ground units.	DZ Tiger, LZs Noni, Gull, Hawk, Owl
	U.S. Government under Army control by ownership or land leases	Schofield Barracks East Range (SBER)	East Range is part of Schofield Barracks Military Reservation, located in central Oahu. SBER (5,154 ac [2,085.8 ha]) provides training land for tactical field exercises.	LZs Lightning, Italy, Ku Tree, Lower 36, Lower 72, Upper 36, Upper 72
		Kahuku Training Area (KTA)	The 9,398-ac (3,803-ha) site is bounded by Kawailoa Training Area (KLOA) to the south, private agricultural lands to the north, and other private lands on the remaining perimeter.	LZs Kanes, Kahuku Split Rock, X Strip

Table 2-3. Proposed Areas/Facilities For Tactical Aviation Training

Island	Owner	Site	Description	LZ/DZ/Helipad/ Airfield[1]
		Kawailoa Training Area (KLOA)	KLOA is bounded by SBER to the south and KTA to the north. KLOA is primarily used for helicopter aviation training. At 23,300 ac (9,429 ha), it is the largest contiguous ground maneuver training area on the island.	LZs Black, Elephants Foot, Nixon, Non Stop, Puu Kapu, Red
	U.S. Government under Army control; airfield is leased and operated by the State DOT Airports Division	Dillingham Airfield	Dillingham Military Reservation (DMR) is a 664-ac (267.7-ha) site located on the west side of Oahu's north shore. The 272-ac (110-ha) airfield is a joint-use general aviation facility for the public and military. Military activities consist largely of night operations and small unit maneuvers.	Airfield, DZ Dillingham, LZs Albatross, Blue Jay, Finch, Rooster
Hawaii	U.S. Government under Army control by ownership and land leases	Pohakuloa Training Area (PTA)	PTA is the largest military training area on the island of Hawaii, located between the mountains of Mauna Loa and Mauna Kea, PTA consists of 131,805 ac (53,339.6 ha) which include areas for ground maneuver and ordnance impact. Ground maneuver areas can support large-scale training, including live-fire training.	DZ Fisher, DZ Mikilua, FARP 12A, FARP 17, FARP 18, and LZs Brad, Noble, Rob, Tango, T11, X-ray, Yankee, Zulu, Buzzard, Chick, Dodo, Dove, Emu, Finch, Gamecock, Kiwi, Loon, Parrot Option, Peacock, Penguin, Robin, Rooster, Seagull, Turkey
		Bradshaw Army Airfield (BAAF)	Located within PTA, BAAF consists of a 4,750-ft (1,448-m) runway and other aviation facilities.	Airfield and Alpha, Bravo, Charlie Helipads
Kauai	U.S. Government under Navy control	Pacific Missile Range Facility (PMRF)	PMRF is a multi-environment range capable of supporting surface, subsurface, air, and space events simultaneously. Training, as well as Research, Development, Testing and Evaluation (RDT&E) activities are also supported. Located at this 2,400-ac (971-ha) facility on the west side of Kauai is the Barking Sands airfield. Offshore Navy training exercises includes electronic combat operations, Special Warfare Operations (SPECWAROPS), Mine Countermeasures, and flare exercises.	Barking Sands Airfield

Table 2-3. Proposed Areas/Facilities For Tactical Aviation Training

Island	Owner	Site	Description	LZ/DZ/Helipad/ Airfield[1]
Kaula	U.S. Government under Navy control	Designated target range area	Kaula is a small 108-ac (43.7-ha) crescent-shaped island located southwest of Niihau. A 10-ac (4-ha) portion at the southern end of Kaula is used by the Navy for aircraft gunnery and inert ordnance target practice.	None
Molokai	U.S. Government under Marine Corps control	Molokai Training Support Facility (MTSF)	MTSF is an inactive, vacant 12-ac (4.9-ha) site located across the highway from Molokai Airport. It was previously used for fueling and facilities support for training activities at the former Molokai Training Area.	Aircraft would land at Molokai Airport for refueling.
	State of Hawaii under DOT Airports Division control	Kalaupapa Airport	This approximately 55-ac (22.3-ha) airport serves the residents of Kalaupapa Settlement and visitors to Kalaupapa National Historic Park. Military operations at the runway are primarily aviation night vision training.[2]	Airfield

Notes

1 Boeing Company. November 2009. MV-22 Site Evaluation Report for U.S. Army Garrison Hawaii.; Boeing Company. February 2011. MV-22 Site Evaluation Report for Marine Corps Base Hawaii. Islands of Kauai, Hawaii, Maui, Molokai, and Lanai Landing Zone Survey. Volume 1.; Boeing Company. March 2011. MV-22 Site Evaluation Report for Marine Corps Base Hawaii. Island of Oahu Landing Zone Survey. Volume 2.

2 http://iata-airport-code.com/airport/Kalaupapa-Airport-LUP, accessed 31 March 2011.

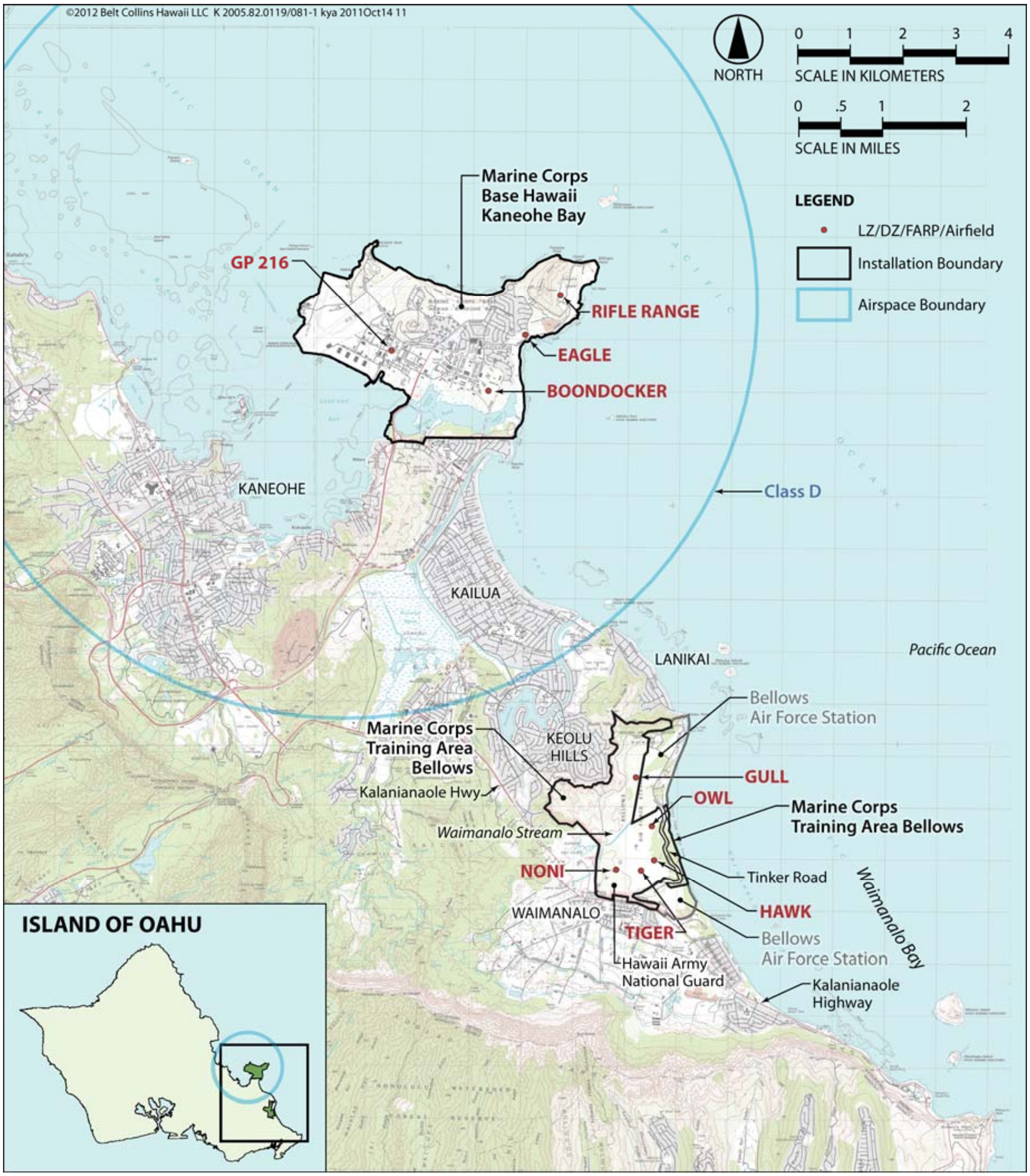


Figure 2-8. Training Areas on Oahu—MCB Hawaii Kaneohe Bay and MCTAB

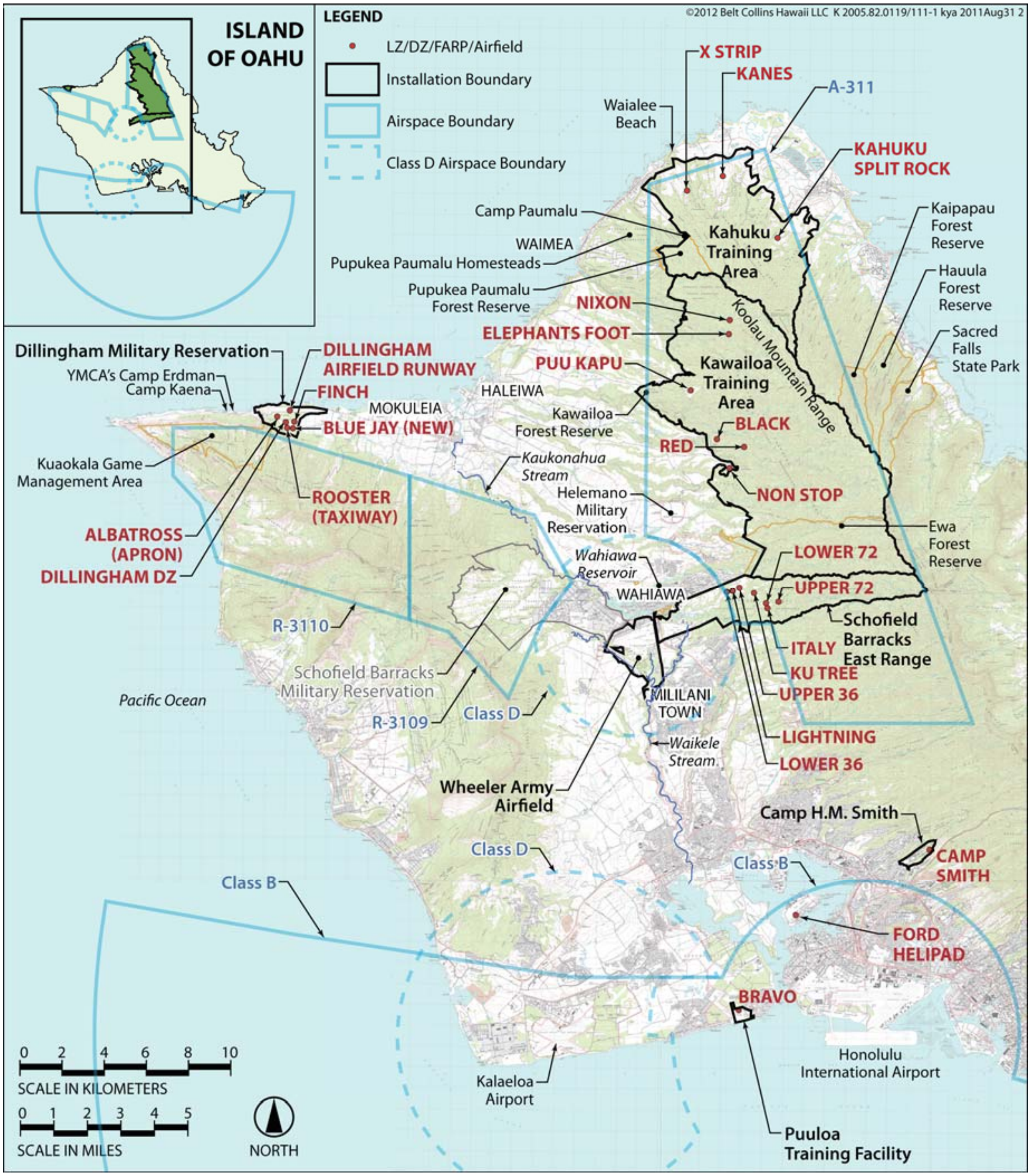


Figure 2-9. Training Areas on Oahu—KTA, KLOA, SBER, and DMR

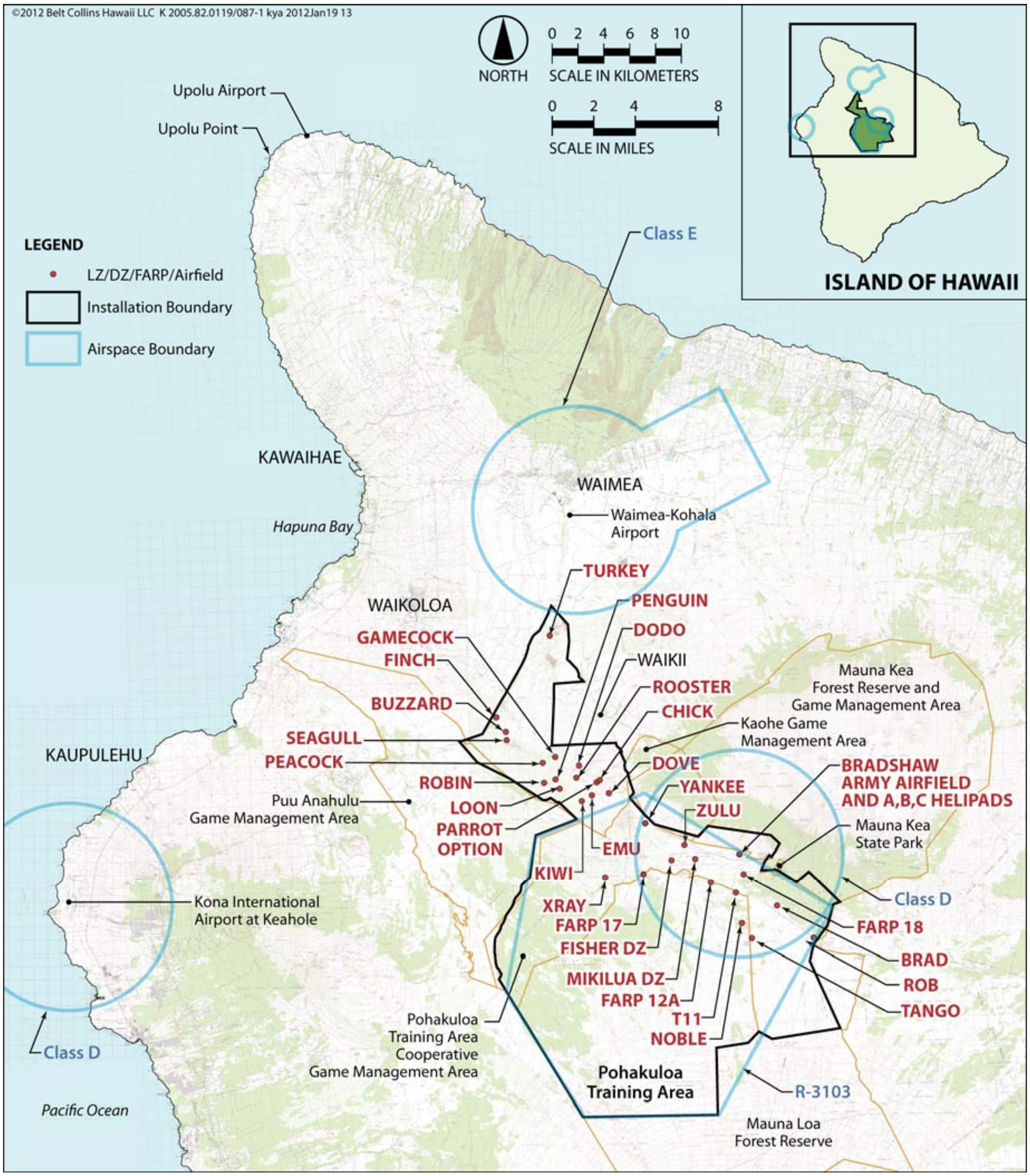


Figure 2-10. Training Areas on Hawaii Island—PTA

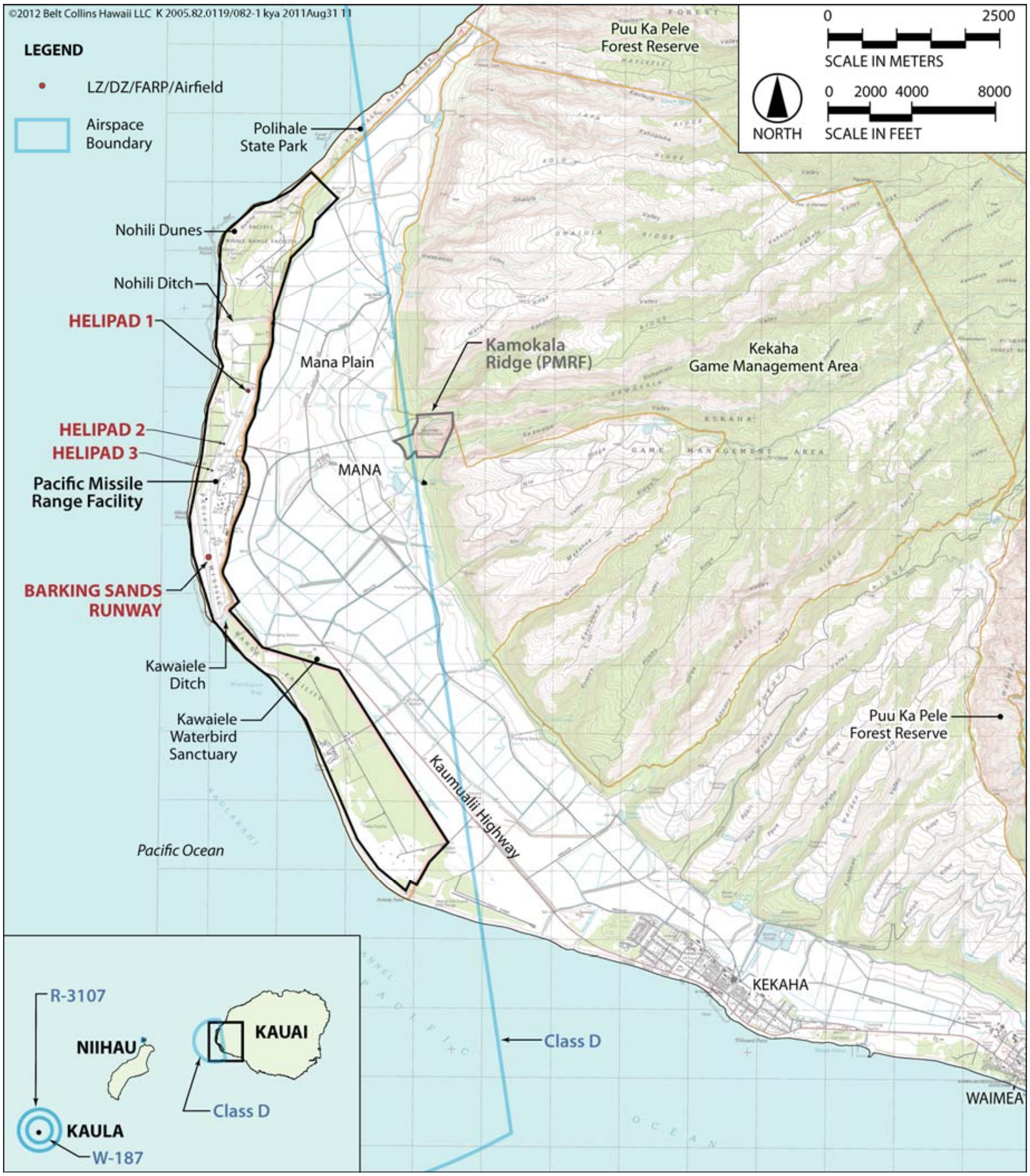
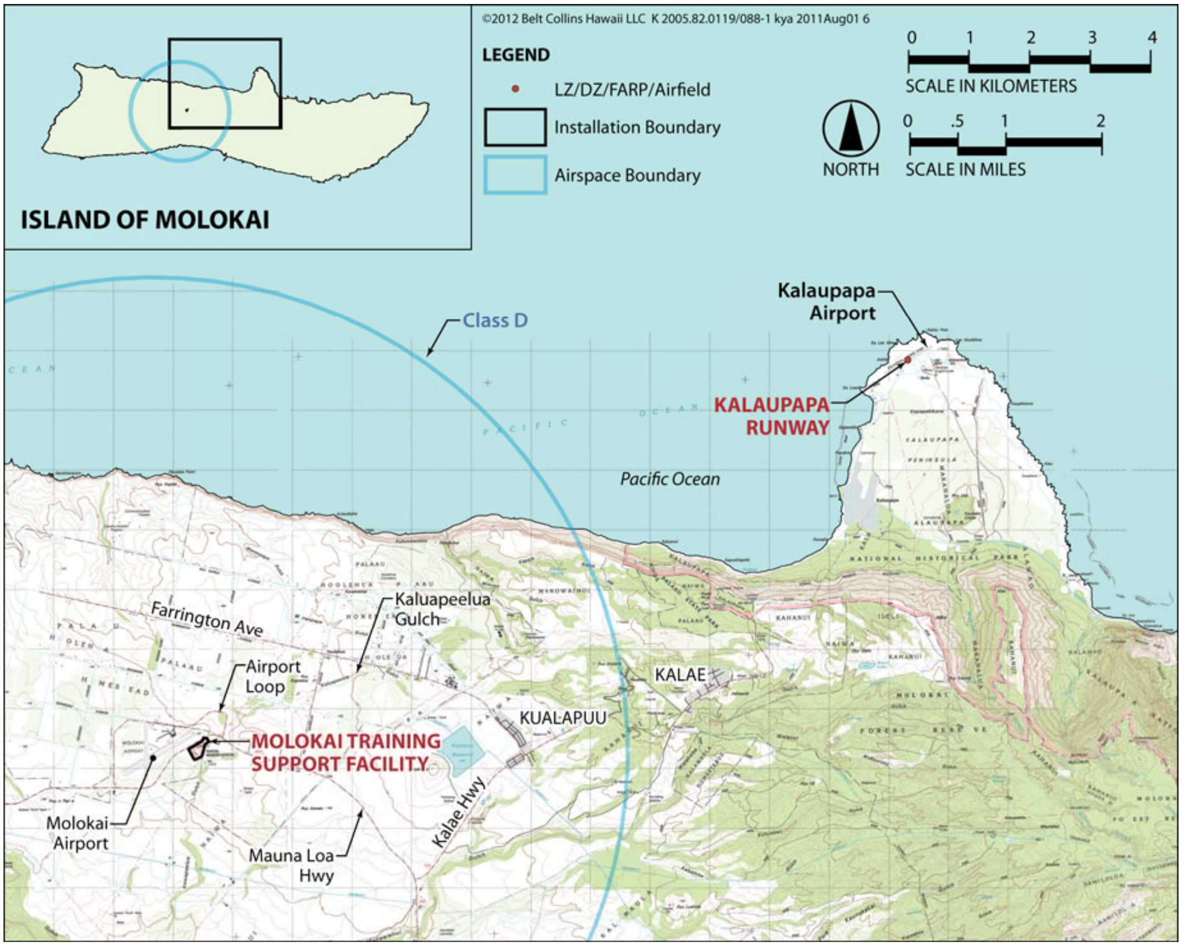


Figure 2-11. Training Areas on Kauai—PMRF



1
2 **Figure 2-12. Training Areas on Molokai—MTSF and Kalaupapa Airport**

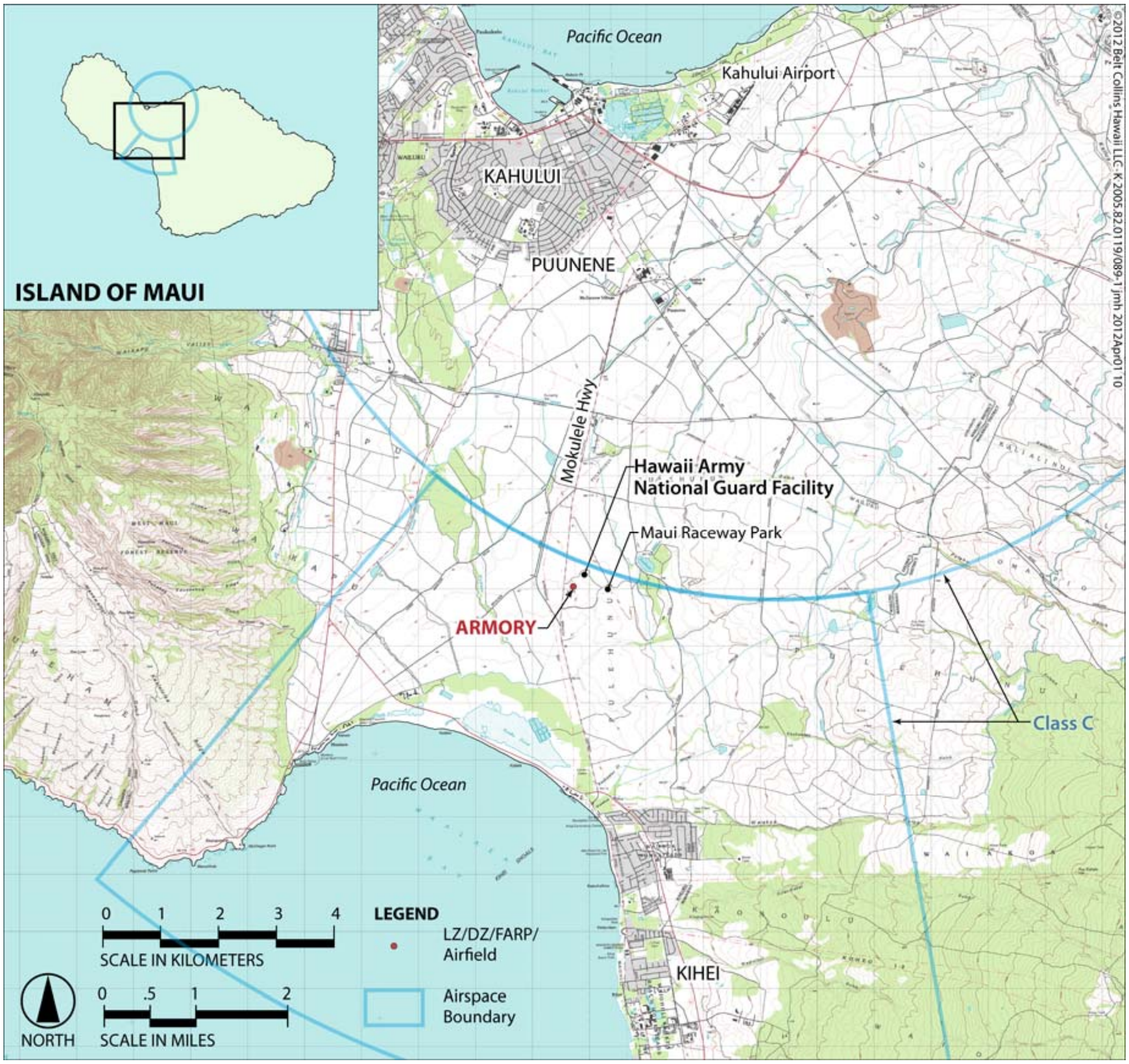


Figure 2-13. Training Areas on Maui—HIARNG Facility

Proposed operations for the MV-22, UH-1Y, and AH-1Z aircraft would fall into two broad categories: familiarization and instrument training, and MAGTF operations with ground forces. Marine Corps aviation training would involve both aircrew and supported ground units to function in combat as an element of the MAGTF. Aviation training events would be geared toward supporting the ground forces with cargo and equipment transport, assault support, and close air support.

Training activities would be developed based on Marine Corps Training and Readiness (T&R) manuals for all three aircraft. The T&R manuals allow the Marine Corps to provide MAGTF commanders with a fully combat-capable squadron to carry out mission-essential tasks. These tasks include:

- Operate from expeditionary sea and shore based sites
- Assault support
- Reconnaissance
- Offensive air support

Table 2-4 summarizes the proposed training activities for each aircraft based on the T&R manuals. Training activities would be adjusted to accommodate the changes in mission and tactical requirements over time. Additional details regarding flight operations at the LZs are in Appendix C-1.

Table 2-4. Summary of Aviation Training Activities

Training Activity	AH-1	UH-1	MV-22
Familiarization/Instrument/Navigation (night and day flights). *Develop intermediate and advanced proficiency in operating the aircraft, both day and night.*	x	x	x
Formation. *Training for flying, takeoff, and landing with other aircraft, usually in a two-ship or four-ship group.*	x	x	x
Field Carrier Landing Practice (FCLP). *Training to land on carrier decks.*	x	x	x
Defensive Combat Maneuvers. *Conduct defensive air maneuvers, countermeasures, and tactics against air-to-air and surface-to-air-threats.*	x	x	x
Weapons / Gunnery. *Live fire practice.*	x	x	x
Terrain Flight (TERF). *Flying and navigating at low altitudes. Typical activities include low level, contour, and nap of the earth (NOE). NOE flights are conducted from as close to the surface as terrain and vegetation allow. Contour and low level flights are from 50 feet above ground up to 200 feet above ground.*	x	x	
Low Altitude Training (LAT). *Training for flying at low altitudes and tactics from 50 feet up to 500 feet above ground.*			x
Assault Support Operations/Special Mission. *Training in techniques for inserting/extracting troops. Insertion activities could include fastrope, parachute operations, and water insertion. Extraction activities could include casualty/medical evacuations, Tactical Recovery of Aircraft and Personnel (TRAP), non-combatant evacuations, search and rescue. Other support activities include command control operations.*		x	x

Table 2-4. Summary of Aviation Training Activities

Training Activity	AH-1	UH-1	MV-22
Confined Area Landing (CAL). *Landings conducted in areas with obstacles, such as high trees, or between buildings.*	x	x	x
Forward Air Controller (Airborne) FAC(A). *Develop aviation personnel to coordinate the actions of aircraft*	x	x	
Tactical Air Controller (Airborne) TAC (A). *Develop aviation personnel to coordinate multiple aircraft (Marine Corps and other branches) and other air controllers. Personnel operate from the UH-1.*		x	
Close Air Support (CAS). *Provide armed support to ground forces.*	x	x	
Cargo / Lift Operations. *Internal and external transport of cargo and equipment.*		x	x
Escort. *Provide armed and unarmed escort to air and ground forces.*	x	x	
Air-to-Air Refueling. *Refueling aircraft while in the air.*			x
Rapid Ground Refueling. *Training includes rapid refueling and Forward Arming and Refueling Point (FARP) procedures.*	x	x	x
Reconnaissance. *Target detection, recognition, and identification during scouting operations.*	x	x	

Sources
U.S. Marine Corps. December 2004. *Aviation Training and Readiness Manual, AH-1.* MCO 3500.48A.
Navy Marine Corps. May 2007. *UH-1Y Training and Readiness Manual.* NAVMC 3500.20.
Navy Marine Corps. March 2010. *MV-22B T&R Manual.* NAVMC 3500.11B

Each facility provides differing capabilities and terrain for training activities. Table 2-5 provides a summary of training activities expected to occur at the various areas. However, training requirements may change over time and could require supplemental analysis under the National Environmental Policy Act (NEPA).

The projected numbers of operations at MCB Hawaii Kaneohe Bay and the training areas are presented in Sections 3.3 (Airspace) and 4.3 (Airspace), respectively. These are conservative numbers (err on overestimating numbers), assuming the presence of all based Marine Corps squadrons in Hawaii. Realistically, a portion of the aviation units would be deployed at any one time (see discussion of unit deployments in Section 1.3).

Table 2-5. Aviation Training Locations and Activities

Island	Area	Activity
Oahu	MCB Hawaii Kaneohe	Field Carrier Landing Practice (FCLP), familiarization/instrument, Confined Area Landings (CAL), night vision device (NVD)
	MCTAB	MAGTF operations, CAL, NVD
	Army Training Areas	Terrain Following (TERF) flights, Assault Support Operations, MAGTF operations, CAL, NVD
	Dillingham Airfield	CAL, MAGTF operations, NVD
Hawaii	PTA	All training except FCLP. Live fire is also conducted at PTA.
Kauai	PMRF	MAGTF operations, CAL, NVD, inert target range on Kaula island. Live fire would also be conducted within PMRF's water training range. Additional training events could include electronic/counter-electronic warfare training.
Molokai	Kalaupapa Airport [1]	CAL, NVD
	MTSF	Refueling (aircraft may land either at MTSF or at the nearby Molokai Airport)
Maui	Hawaii Army National Guard (HIARNG) Facility	Administrative aviation use only; no tactical aviation operations planned.

1 Use to be determined through continuing NHPA Section 106 consultation.

All Marine Corps squadrons have requirements to conduct night training at an unlit field or remote landing site free from artificial illumination. Night training is required, both to familiarize pilots with use of night vision goggles during flights, and because pilots must become familiar with how to operate under conditions where there is no instrumentation or lighting. Table 2-5 identifies facilities proposed for night vision device (NVD) training.

As explained in Section 2.2, various non-military sites would continue to be used and consist mainly of State airports routinely used by existing Marine Corps squadrons for flight operations, refueling, and related activities. The proposed MV-22 and UH-1/AH-1 aircraft would use these sites in accordance with FAA procedures and in coordination with State DOT, Airports Division.

Use of these airports is allowed under Title 49, U.S.C., Chapter 471, "Airport Development," which provides that airports developed with financial assistance from the U.S. government will be available without charge for use by U.S. government aircraft in common with other aircraft, except that where the use is substantial, the government may be charged a reasonable share of the cost of operating and maintaining the facility used.

All State airports would be used occasionally for routine or "administrative" flight operations by the squadrons; these operations are generally limited to landings and take offs. Administrative use may also occur during emergencies or for specific purposes, such as refueling, VIP transport, or medical evacuations. Marine Corps pilots must familiarize themselves with State airports to prepare for contingencies such as natural disasters and emergencies. Use of State airports by Marine Corps aircraft would not be substantial. Currently available data indicates at least some military use at 14 State airports, with Honolulu International, Kalaeloa, and Kona International Airports receiving the highest volume of military aircraft use (see Table 2-6). Military use at these and other State airports is generally 12 percent or less of total use, with the highest percentage at Kalaeloa Airport (19 percent). Administrative operations anticipated with the MV-22 and H-1 are estimated in Table 2-6 (supporting presumptions are presented in Appendix C-3). With the proposed MV-22 and H-1 aircraft, most increases are estimated to be less than 1 percent of the total current use of the airport by civilian and government aircraft. An increase of less than 1 percent in use would not appreciably affect the environmental resources/issues evaluated in this document, e.g., soils, noise, air quality, at these existing airports and are, therefore, not further analyzed in this FEIS.

Table 2-6. Proposed Action Administrative Operations at State Airports

	Baseline Conditions (2009)		Proposed Action	
Airport[1]	**Total Operations[2]**	**Military Operations to Total Operations[2]**	**MV-22 & H-1 Administrative Operations**	**MV-22 & H-1 Administrative Operations to Total Operations**
Oahu				
Dillingham Airfield	49,758	2%[4]	79	0.13%
Honolulu International Airport	274,434	9%	79	0.02%
Kalaeloa Airport	128,732	19%	79	0.05%

Table 2-6. Proposed Action Administrative Operations at State Airports

Airport[1]	Baseline Conditions (2009)		Proposed Action	
	Total Operations[2]	Military Operations to Total Operations[2]	MV-22 & H-1 Administrative Operations	MV-22 & H-1 Administrative Operations to Total Operations
Hawaii				
Hilo International Airport	67.851	9%	127	0.19%
Kona International Airport	109,581	12%	306	0.28%
Upolu Airport	800[3]	10%[4]	25	3.08%
Waimea-Kohala Airport	2,238	2%[4]	51	2.22%
Kauai				
Lihue Airport	99,171	6%	99	0.10%
Port Allen Airport	2,120	0.45%[4]	11	0.52%
Molokai				
Kalaupapa Airport	3,094	7%[4]	0	0%
Molokai Airport	24,295	3%	69	0.28%

Notes

1 Lanai, Kahului, and Hana Airports not considered for admin use as the Marine Corps would not conduct tactical training on these islands. Kapalua Airport would not be considered for admin use due to helicopter and military training restrictions.

2 State of Hawaii, Department of Business, Economic Development and Tourism. 2011. The State of Hawaii Data Book 2010. http://hawaii.gov/dbedt/info/economic/databook/.

3 Upolu Airport data provided by DOT Airports Division via personal communication with Belt Collins Hawaii Ltd.

4 Military use based on data provided at www.gcr1.com/5010web/.

Certain State airports are suitable for night training. Other than the difference in appearance of the aircraft and the time of day (7PM to 10:30PM), the nature of the training for these events would be indistinguishable from that conducted by commercial and private aircraft. In the conduct of these night flights, Marine Corps aircraft are not armed or loaded with ordnance.

For the VMM squadrons, the requirements for night training can be conducted at LZs or at dark airports within the state. For the HMLA squadrons, a runway environment provides a more user-friendly environment for night flights, free from other variables that make unimproved LZs less desirable for this type of training. Dark airports are those that have no runway or tower lighting at night. Considering the aforementioned and training location criteria described in Section 2.3.1, the following State-owned or -operated, federally obligated airports suitable for night training use are: Dillingham, Kalaeloa, Molokai, Kalaupapa, and Lanai airports. Of these, Kalaeloa and Molokai are less desirable for night training, due to ambient light from the local community around these airports.

2.4.2.3 Aviation Training Facilities Improvements

In addition to the development of facilities at MCB Hawaii Kaneohe Bay, action alternatives would include construction of improvements to existing facilities at selected sites proposed for use by the VMM and HMLA squadrons for aviation training. Physical improvements to existing training facilities are anticipated only at MCTAB, PTA, and MTSF. The projects at MCTAB and PTA would focus on landing zones considered either substandard or inadequate[15] for use by the MV-22 aircraft. They may involve enlarging the landing zone and/or paving, along with associated clearing, grubbing and grading. At MTSF, improvements may include clearing, grubbing, grading, paving, and fencing.

At MCTAB, upgrades to the existing landing zones would occur at LZs Gull, Hawk, Owl, and Noni (Figure 2-8). No improvements are anticipated at DZ Tiger.

At PTA, improvements are proposed in the vicinity of Bradshaw Army Airfield (Figure 2-14). The Bravo helipads would be improved and enlarged to accommodate the MV-22 aircraft.

MTSF (Figure 2-15) would be used for Forward Arming and Refueling Point (FARP) training activities for the Marine Wing Support Detachment (MWSD). The facility would support refueling training activities by providing a secured area for MWSD and equipment. Limited improvements may include clearing and grubbing, and grading and paving if needed. A fence would be installed around the property. Aircraft would land at Molokai Airport for refueling operations. MTSF would also serve as an emergency divert landing area in the event aircraft

[15] An LZ may be considered substandard or inadequate because it does not fully satisfy MV-22 support requirements as derived from the MV-22 Facilities Requirements Document or applicable Unified Facilities Criteria (UFCs). Substandard conditions could be mitigated through minor repairs or construction, while inadequate LZs would require major upgrades, repairs, or construction. Factors taken into account include the size of the LZ, condition of the surface, and presence of nearby obstructions.

carrying unarmed ordnance transiting between Oahu and the island of Hawaii encounter bad weather or problems with the aircraft.

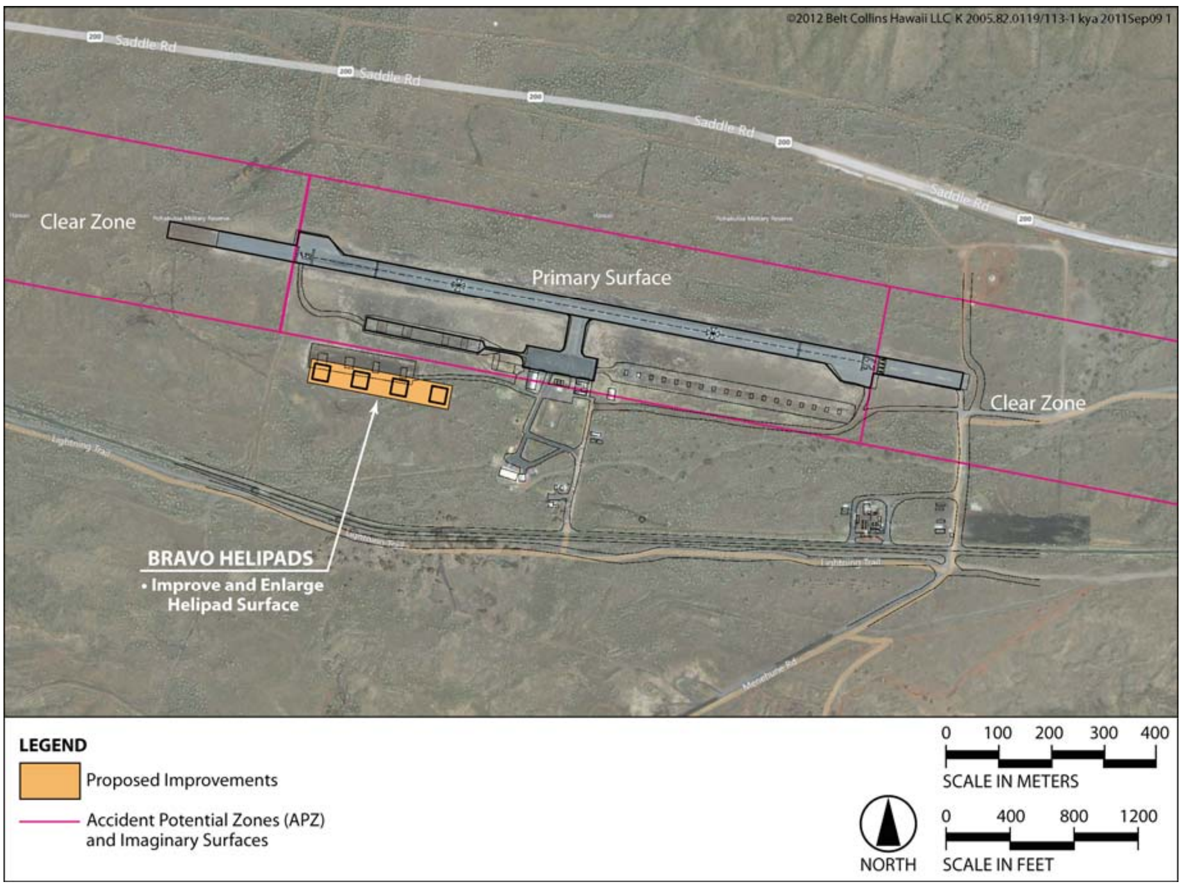


Figure 2-14. Bradshaw Army Airfield Improvements

Figure 2-15. MTSF Improvements

Proposed training facilities improvements are summarized in Table 2-7.

Table 2-7. Proposed Training Facilities Improvements

Island	Area	Facility/LZ	Improvement	Approximate Scope
Oahu	MCTAB	Gull	Reinforce concrete	1,110 SY
	MCTAB	Hawk	Reinforce concrete	1,110 SY
	MCTAB	Owl	Reinforce concrete	1,110 SY
	MCTAB	Noni	Reinforce concrete	1,110 SY
Hawaii	PTA	Bravo	Expand existing helipads	15,000 SY
Molokai	MTSF		Clear, grub, grade, pave	2,220 SY
	MTSF		Install fence	3,200 FT

2.4.3 ALTERNATIVE B

Alternative B would be similar to Alternative A, with the exception of the location of the VMM squadron hangars, apron, and support facilities and plans for BEQ improvements at MCB Hawaii Kaneohe Bay. Aviation training activities and locations, as well as aviation training facilities improvements described in Sections 2.4.2.2 and 2.4.2.3, would be the same for Alternatives A and B. Figure 2-16 shows an overview of Alternative B VMM squadron facilities at MCB Hawaii Kaneohe Bay.

Alternative B (Figure 2-16) would include VMM squadron facilities at West Field on the northwest side of the runway. In order to construct the hangars and apron, 18 existing facilities and structures would be demolished (Figure 2-17). Of these structures half are vacant or inadequate and would not be replaced, including revetments (Facilities 14, 15, and 17), torpedo storehouse (Building 612), Quonset hut (Building 620), fuel bladder containment (Facilities 3076, 3077, 3078, and 3079), fuel facility (Building 3087), and storage facilities (Buildings 995 and 6478). Facilities that would be demolished and replaced include storage for MCAS (Buildings 601, 602 and 620), storage for MALS-24 (Building 603), offices and training spaces for explosive ordnance disposal (EOD) team[16] (Building 605), MALS-24 engine test facility (Building 6183), game warden office and kennel (Building 3099), and the aircraft engine power check pad (Facility 5020). The MCAS, MALS-24, EOD, and game warden facilities would be relocated to the area behind Building 4075, where new facilities would be built. The aircraft engine power check pad would be rebuilt along the West Field taxiway. Ten of the 18 facilities planned for demolition are eligible for the National Register: Facilities 14, 15, 17, 601, 602, 603, 605, 612, 620, and 995.

Sumner Road would be closed from Mokapu Road and rerouted with access from Pali Kilo Road. As shown in Figure 2-16, HMLA and other squadrons would be located on the southeast side of the runway, maximizing the use of existing hangars.

[16] The EOD team is the first responders for ordnance incidences at MCB Hawaii Kaneohe including the airfield and firing range.

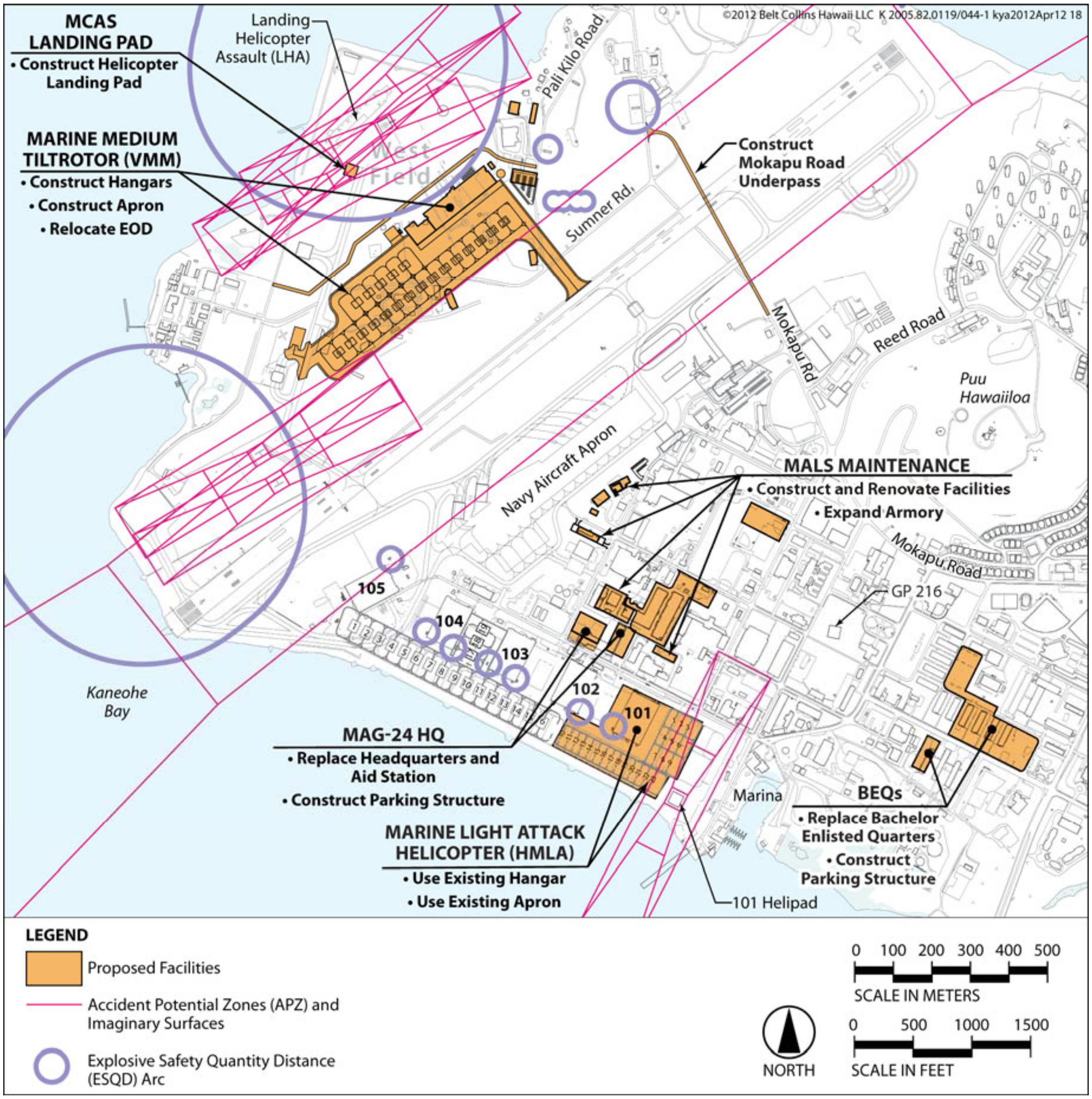


Figure 2-16. Alternative B—Overview, MCB Hawaii Kaneohe Bay

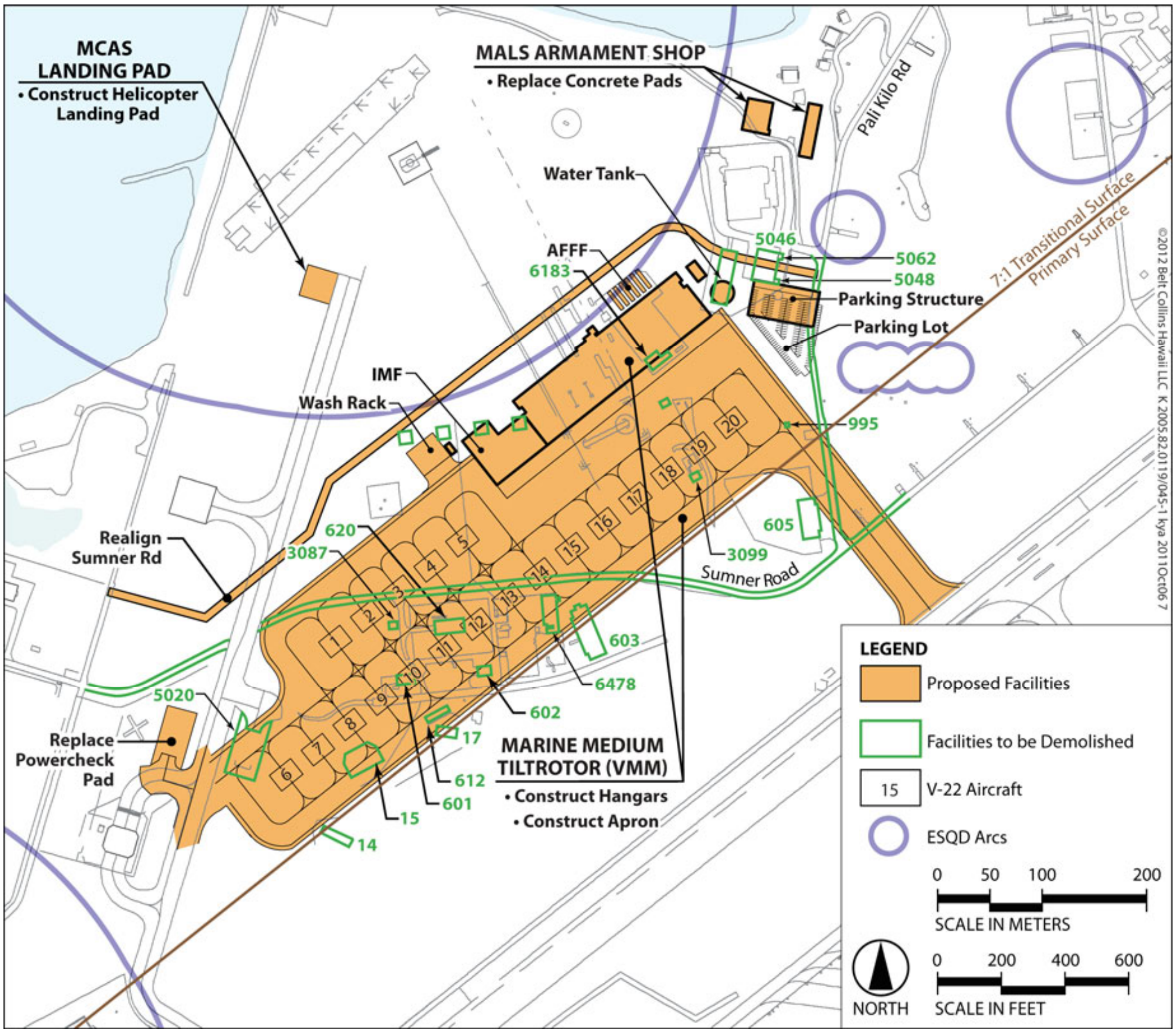


Figure 2-17. Alternative B—VMM Hangar and Apron, MCB Hawaii Kaneohe Bay

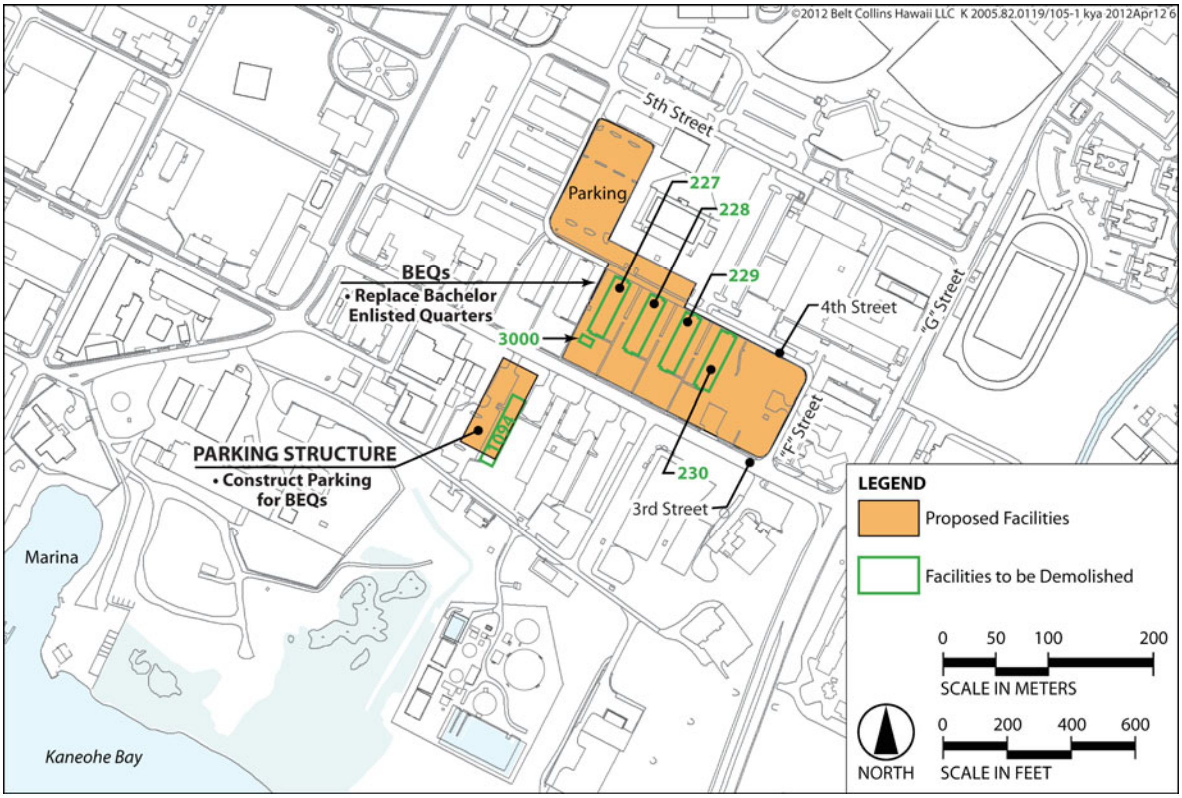
To accommodate the increase in vehicular traffic due to personnel traveling to and from West Field, a 2,000-ft (600-m)-long underpass would be built near Mokapu Road under the existing runway (Figure 2-16). This would limit disturbance to runway operations by facilitating access to West Field. The underpass would be a tunnel in which the directional lanes of traffic are separated for safety. The divided tunnel would allow provisions for emergency egress into the other tunnel. A 10-ft (3-m)-wide right shoulder and a sidewalk would be included along the 12-ft (3.66-m)-wide travelway. The total width of the tunnel would be approximately 65 ft (19.66 m). A 14-ft (4.3-m) height clearance would be maintained through the tunnel. Any vehicle exceeding this height limit would need to utilize the existing Mokapu Road at-grade crossing. The tunnel would require relocation of electrical, drainage, and water utilities. A tunnel drainage system would be necessary and would require a wet well to store storm water runoff, as well as multiple pumps to convey storm water runoff from the wet well to the existing storm drainage system.

Construction of an underpass would require over excavation and installation of earth retaining and lateral support systems, dewatering, and subgrade preparation. The open cut installation of trenching and backfilling would impact airfield operations. The northern entrance of the tunnel (where vehicles would enter and exit the tunnel) would be located within the primary surface of the runway (see Figure 2-16). To allow vehicles in the primary surface, an airfield waiver would be required. Construction of an underpass would involve excavation and removal of over 140,000 cubic yards (CY) (107,038 cubic meters [CM]) of material. Construction would take about 18 months.

West Field is severely constrained by ESQD arcs (Figure 2-16 and Figure 2-17) associated with ordnance operations, as well as required obstruction-free areas for the airfield. Although not optimal, Alternative B provides space to accommodate two VMM squadrons. Hence, this option is considered a reasonable alternative for evaluation in this EIS.

Under Alternative B, two six-story buildings would be constructed to accommodate additional personnel in BEQs (Figure 2-18). The new buildings would provide approximately 304 rooms, each room accommodating one or two persons depending on rank (same number of rooms as in Alternative A). The new BEQs would replace the existing historic BEQ Buildings 227, 228, 229, and 230, which would be demolished. These facilities are very old, difficult to maintain, not energy-efficient, and do not provide a good quality of life for occupants. Buildings 225 and 226, also eligible for listing in the NRHP, would be retained and reused for administrative or other support functions as part of a separate action not evaluated in this document. The chilled water plant (Building 3000) and associated covered walkways would be demolished. A multi-story parking structure would be built across the street from the new bachelor quarters to provide resident parking. Building 1094 would be demolished. Improvements would be made to the existing parking lot located north of the BEQs.

Table 2-8 summarizes the VMM hangar and apron improvements and the bachelor housing option proposed at MCB Hawaii Kaneohe Bay under Alternative B. All of the other facilities listed in Table 2-2, except the BEQ, are applicable to Alternative B. As with Alternative A, roof-top solar thermal and/or photovoltaic technologies would be incorporated into facilities in accordance with Marine Corps policy.

1


2 **Figure 2-18. Alternative B—Bachelor Enlisted Quarters, MCB Hawaii Kaneohe Bay**

Table 2-8. Alternative B - Basing Facilities Improvements

Facility	Location	Improvements (Building Number)	Approximate Scope
VMM hangar and apron	West Field (northwest of runway)	Demolish facilities and structures (14, 15, 17, 612, 601, 602, 603, 605, 620, 3076, 3077, 3078, 3079, 3087, 6183, 3099, 995, and 6478)	-25,800 SF
		Demolish aircraft power check pad (5020)	-3,790 SY
		Construct hangar and IMF	144,000 SF
		Construct apron, wash rack, and taxiway	140,200 SY
		Replace MCAS storage (601, 602, 620)	6,900 SF
		Replace MALS storage (603)	8,300 SF

Table 2-8. Alternative B - Basing Facilities Improvements

Facility	Location	Improvements (Building Number)	Approximate Scope
		Replace EOD offices and training facility (605)	7,000 SF
		Replace MALS engine test facility (6183)	1,250 SF
		Replace game warden office and kennel (3099)	850 SF
		Replace aircraft power check pad (5020)	3,790 SY
		Realign Sumner Road	2,740 FT
Runway underpass	Mokapu Road	Construct runway underpass	2,000 FT
Bachelor housing	3rd Street and 503	Demolish existing BEQs (227, 228, 229, and 230) and associated structures (3000, 1001 to 1006) and B1094	-68,200 SF
		Replace with two six-story BEQs	181,700 SF
		Demolish existing building (1094) for parking structure	21,000 SF
		Construct parking structure	17,500 SY
		Improve existing parking lot	10,700 SY

2.4.4 NO ACTION ALTERNATIVE

Analysis of the No Action Alternative provides a benchmark that enables decision-makers to evaluate the environmental consequences of the proposed basing alternatives. Section 1502.14(d) of the NEPA requires an EIS to analyze the No Action Alternative. No action means that an action would not take place, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed basing activity to go forward.

Under the No Action Alternative (using the planning horizon of year 2018 for this EIS, as explained in Section 2.2), the VMM and HMLA squadrons would not be based in Hawaii, and no facilities would be constructed at MCB Hawaii Kaneohe Bay or any of the other training areas to accommodate them. The HMLA squadron proposed for assignment in Hawaii would remain at MCB Camp Pendleton in California. VMM squadrons proposed for assignment in Hawaii would be based elsewhere. Current/baseline operations and support of existing capabilities at MCB Hawaii Kaneohe Bay would continue. The MAG-24's HMH squadrons would convert from CH-53Ds to CH-53E and reduce from three to two squadrons.[17]

The No Action Alternative would not meet mission requirements. MAG-24 would not have the "next generation equipment" needed to support III MEF—the MV-22 Osprey, with its ability to take off vertically, transition to airplane mode for forward flight, and convert to helicopter mode for landing. The 3d Regiment at MCB Hawaii Kaneohe Bay would continue to lack specific aviation assets for troop transport and offensive air support. To address existing deficiencies, MAG-24 would continue work-arounds through gap deployment from elsewhere, for example, from the continental U.S.

2.4.5 PREFERRED ALTERNATIVE

The DoN has selected Alternative A as the Preferred Alternative. The Preferred Alternative would base and operate up to two VMM squadrons and one HMLA squadron in Hawaii; accommodate all of the basing facilities on the south side of the runway at MCB Hawaii Kaneohe Bay; improve existing training areas at MCTAB, PTA, and MTSF; and conduct aviation training, readiness, and special exercise operations at statewide training facilities.

2.5 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD FOR ANALYSIS

In addition to the proposed alternatives, the Marine Corps considered three other alternatives. These alternatives and the reasons why they were not carried forward for analysis in this EIS are presented below:

- **The basing of only the VMM squadrons at MCB Hawaii Kaneohe Bay, without the HMLA squadron.**[18] Under this option, the HMLA squadron would remain at MCB Camp Pendleton (Figure 2-19). Including both VMM and HMLA is considered optimal and hence preferred. As stated in the purpose and need, the proposed action would ensure a single deployable fighting unit to support III MEF operations by correcting the Hawaii Air Combat Element's (ACE's) deficiency within the Hawaii MAGTF. Basing only the VMM squadrons without the HMLA squadron would continue the disaggregation of MAG-24 and the requirement for adjustments through gap deployments. Therefore, this option was not considered a reasonable alternative.

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[17] The CH-53Es are expected to be replaced by the CH-53K, which currently in development.

[18] Without the HMLA facilities, an estimated 1.2 million SF of space would be required to accommodate only the VMM squadrons, plus additional space for trainer facilities, BEQ, and MALS vans. Other than MCB Hawaii Kaneohe Bay, none of the other potential basing locations have adequate capacity for this development.

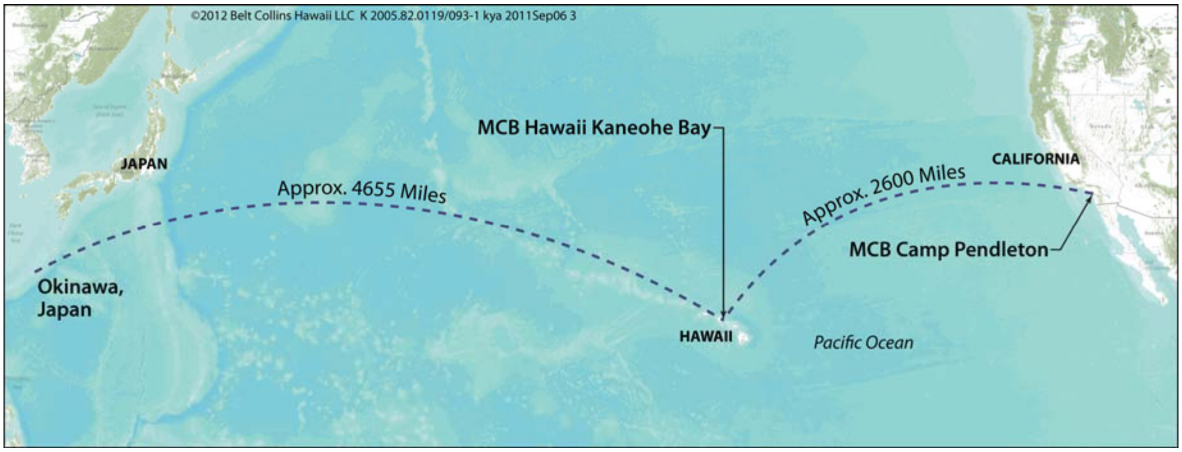

Figure 2-19. MCB Camp Pendleton Location

- **The siting of all aviation facilities on the southeast side of the runway and the demolition of Hangars 103 and 104.** Hangars 103 and 104 are fully utilized by the Navy. Demolition of these buildings would provide apron space for the MV-22s, but would require finding hangar space for the displaced Navy squadrons and also fail to meet the objective of reusing existing facilities to the greatest extent practicable. Furthermore, the hangars are eligible for listing in the NRHP. This option has the least available hangar and apron space in comparison to the other options, thus offering less flexibility in the phasing of construction to assure uninterrupted operations. Given limited space, competing uses, and the need to construct replacement hangars, this option was not considered a reasonable alternative.

- **Split basing with the HMLA squadron based at MCB Hawaii Kaneohe Bay and the VMM squadrons based at either Joint Base Pearl Harbor-Hickam or Wheeler Army Airfield.** The Marine Corps considered splitting personnel, aircraft, and facilities between two basing locations. However, this option was rejected since it would result in dispersion of command and control, reduced effectiveness, increased manpower requirements, and increased redundancies, including the requirement for a MALS and other functions at each base. Two basing locations would likely require the construction of additional facilities, as well as higher fuel usage to travel between the bases by aircraft and by ground transport.

  Two DoD installations were considered as possible locations for split basing: Wheeler Army Airfield and Hickam Air Force Base (presently part of Joint Base Pearl Harbor-Hickam). The Marine Corps considered a scenario that would home-base one HMLA squadron at MCB Hawaii Kaneohe Bay and home-base both VMM squadrons at either

Wheeler or Hickam, which are the only other DoD installations on the island of Oahu with the required runway and airfield support to accommodate the MV-22 aircraft. The option of home-basing the VMM squadrons and split-basing the HMLA squadron was not considered because existing facilities at MCB Hawaii Kaneohe Bay are available and can be renovated to accommodate the HMLA squadron.

The potential split-basing locations were analyzed to determine whether they met the MV-22 airfield requirements and had adequate hangar, apron, and support space to accommodate 24 aircraft and their crews, as well as space for MALS aircraft maintenance facilities and storage associated with aircraft operations and maintenance. No bachelor or family housing, dining facilities, or personnel support would be required. It was assumed that these facilities are available at MCB Hawaii Kaneohe Bay and that the Marines would commute to work each day. As discussed above in Section 2.3.2, Hickam does not meet the airfield requirements, and Wheeler lacks sufficient facility capacity or space available for construction/expansion to meet the Marine Corps squadrons' basing requirements.

2.6 MANAGEMENT MEASURES

This section describes best management practices (BMPs), conservation measures, and standing operating procedures (SOPs) that would be incorporated into the development alternatives (A and B) to either avoid or minimize potential impacts. Many requirements discussed in this section would be largely addressed by including protective measures within the alternatives as required by federal, state, or county laws and regulations. When conducting operations at training areas owned by others, such as the Army, SOPs for those training areas would also apply.

2.6.1 CONSTRUCTION ACTIVITIES

Measures would be implemented to control short-term construction-related impacts as required by law. Management constraints on demolition and construction activities are designed to avoid or minimize erosion and sediment runoff, fugitive dust, emissions from vehicles and equipment, traffic congestion, noise, release of hazardous substances or wastes, and impacts relating to solid waste disposal and paving operations, discussed below.[19] In addition, archaeological monitoring would be conducted during construction that involves ground disturbing activities to minimize impacts on cultural resources.

[19] The following reference was used to describe potential best management practices for construction activities: City and County of Honolulu, Department of Environmental Services, in cooperation with The General Contractors Association of Hawaii (May 1999). *Best management practices manual for construction sites in Honolulu.*

2.6.1.1 Erosion and Sediment Control

Best management practices (BMPs) would be implemented for erosion and sediment control during construction, as required under National Pollution Discharge and Elimination System (NPDES) permits from the State of Hawaii Department of Health (DOH). Storm water runoff would be contained on-site and would conform to the Navy and Marine Corps Low Impact Development (LID) Policy for Storm Water Management. BMPs may include the following measures:

- Schedule/phasing of construction activities such as grading to reduce the amount and duration of soil exposed to erosion.
- Preservation of existing vegetation to maintain plants that serve as erosion control, for example, on slopes or in drainage channels.
- Vegetative stabilization to provide either long-term or temporary soil stabilization: seeding and planting in graded areas, on slopes, and in swales; mulching to temporarily stabilize areas that cannot be seeded or planted.
- Physical stabilization measures: geotextiles and mats in areas such as channels and slopes; use of gravel, aggregate, or other materials to stabilize construction roads and entrances to construction sites.
- Protection of stockpiles of gravel, topsoil, excavated materials, and imported materials: providing adequate setbacks from waterways; using silt fences; installing cover, grass, or other stabilization measures; installing silt basins.
- Diversion of runoff: installing temporary drains and swales to direct runoff from stabilized areas, around disturbed areas, and into sediment basins or traps; installing a slope drain—a temporary pipe or lined channel to drain the top of a slope to a discharge point at the bottom of the slope without causing erosion.
- Measures to reduce storm water flow velocities to prevent erosion: installing rock outlet protection at a pipe outlet, installing check dams across swales or drainage ditches, and slope roughening/terracing prior to seeding and planting.
- Sediment trapping/filtering: installing silt fences to detain sedimentation behind the fence; stacking sand bag barriers to detain sediment-laden water; a brush or rock filter to detain sheet flow; storm drain inlet protection devises to detain sediment-laden runoff and allow sediment to settle prior to discharge into a storm drain inlet or catch basin; sediment basin designed to retain or detain runoff to allow sediment to settle.

2.6.1.2 Dust Control

Dust control measures would be used to stabilize soil from wind erosion and reduce dust generated by construction activities. The proposed projects would comply with State DOH requirements for dust control (Hawaii Administrative Rules [HAR] 11-60.1). BMPs may include the following, to be implemented as appropriate for the given site conditions.

- Scheduling construction activities to minimize exposed areas.
- Stabilizing exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride or other chemicals, sprinkling, and/or stone/gravel layering.
- Stabilizing construction roads, construction entrances, parking and staging areas. Reducing speed and trips on unpaved roads.
- Providing rapid cleanup of sediments deposited on paved roads.
- Covering haul trucks transporting materials that contribute to dust.
- Implementing dust control measures for material stockpiles.

2.6.1.3 Air Pollutant Emissions Control

The proposed action is located in the State of Hawaii, a region that is classified as in attainment of the National Ambient Air Quality Standards (NAAQS). Air emissions from stationary sources, if used by contractors during construction or as part of longer term operations, would be permitted as required by DOH in accordance with HAR 11-60-1 and as established under the Clean Air Act and Amendments. Fugitive dust would be minimized since HAR 11-60.1.33 prohibits the generation of visible fugitive dust without taking reasonable precautions, such as the use of water for controlling dust during demolition.

2.6.1.4 Traffic Control

As needed, construction-related traffic can be minimized by traffic management plans which limit certain activities to non-peak hours and provide control measures.

2.6.1.5 Noise Control

Construction noise impacts are minimized by the use of mufflers on vehicles and equipment and by limiting noise-generating activities to daylight hours.

2.6.1.6 Hazardous Materials and Waste Management

Hazardous substances have hazardous physical and chemical properties and/or high toxicity. They are called hazardous materials before and during their use and become hazardous wastes when no longer needed. Hazardous substances include but are not limited to polychlorinated biphenyls (PCB), paints and solvents, herbicides and pesticides, and petroleum products such as oils, fuels, and grease. The proposed action would involve the use and/or generation of hazardous materials/wastes during demolition, construction, and operation.

The handling, storage, and disposal of hazardous materials and waste would be carried out subject to various federal statutory and regulatory authorities:

- Resource Conservation and Recovery Act (RCRA)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- Toxic Substances Control Act (TSCA) of 1976
- Community Environmental Response Facilitation Act (CERFA)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
- Federal Facilities Compliance Act (FFCA)
- Hazardous Materials Transportation Act
- Pollution Prevention Act (PPA) of 1990
- Executive Order (EO) 12088, Federal Compliance with Pollution Control Standards
- EO 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements

As part of the proposed action, measures would be implemented to prevent or reduce the discharge of pollutants to storm water and to the land through proper material use, waste disposal, and training of employees, contractors, and subcontractors. Spill prevention control procedures would be in place to reduce the chance for spills, stop sources of spills, contain and clean up spills, and properly dispose of spill materials. Examples of management measures include the following:

- *During paving:* avoid paving during wet weather; use asphalt emulsions as prime coat where possible; store materials away from drainageways; employ BMPs to divert runoff or trap/filter sediment; use drip pans or absorbent materials under paving equipment when not in use; block/protect catch basins and cover manholes when applying seal coat and the like; and if paving involves an onsite mixing plant, follow storm water permitting requirements for industrial activities.
- *During structure construction and painting:* enclose, cover, or berm building material storage areas; use good housekeeping practices; use safer alternative products to the maximum extent practicable; dispose of residual paints, solvents, etc. according to applicable laws and regulations; and recycle to the maximum extent practicable; and properly dispose of sand blasted material. Note: Chips and dust from marine paints and paints containing lead will be disposed of as hazardous waste. Hazardous waste that cannot be reused or recycled will be disposed of by licensed hazardous waste haulers.
- *During material delivery and storage:* minimize storage of hazardous materials onsite; store materials in designated, paved areas surrounded by berms or approved

containment devices; keep accurate, up-to-date inventories of materials; maintain a complete set of material safety data sheets at the project site; keep chemicals in their original containers and well labeled; and train personnel in emergency spill cleanup procedures.

- *During material use:* use alternative products and minimize hazardous material use onsite; follow manufacturer's instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals; assure that personnel who use pesticides are trained and certified in their use; and do not over apply fertilizers, herbicides, and pesticides.
- *During demolition:* dispose of hazardous wastes in accordance with applicable federal, state, and county regulations. These wastes include sandblasting grit or chips contaminated with lead, cadmium, or chromium-based paints; asbestos; and PCBs (particularly in older transformers).
- *During construction vehicle and equipment cleaning, fueling, maintenance:* carry out these activities at offsite facilities as much as possible; if performed onsite, follow spill prevention and control measures and perform the activity in designated areas located away from drainageways; regularly inspect onsite vehicles and equipment for leaks and repair immediately.

2.6.1.7 Solid Waste Management

Construction and demolition (C&D) waste is generally defined as solid, largely inert waste resulting from the demolition or razing of buildings, roads, or other structures. (Note: Materials contaminated with hazardous substances, friable asbestos, waste paint, solvents, sealers, adhesives, and the like are not accepted at C&D disposal sites.) C&D waste also includes inert fill material such as earth, soil, rock, cured asphalt, brick, and clean concrete not containing vegetation, other organic material, or other solid waste.

To the extent practicable, recycling and reuse is encouraged over the disposal of C&D waste.[20] Solid waste reduction practices include onsite separation of recyclable C&D materials from waste intended for disposal, scheduling pickups for recyclable materials, and salvaging or recycling useful materials. For example, trees and shrubs from land clearing can be used as brush barriers or converted into wood chips to be used as mulch on graded areas.

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[20] The State Department of Health, Office of Solid Waste Management, has developed a guide, "Minimizing Construction and Demolition Waste," especially for contractors, builders, architects and other design professionals. The State Department of Business, Economic Development, and Tourism, Clean Hawaii Center, has published a specialized waste management guide for contractors supervising C&D activities: "A Contractor's Waste Management Guide: Best Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii."

Measures would be implemented to prevent or reduce discharge of pollutants to the land, groundwater, or storm water from construction and demolition waste and other solid waste. Examples include the following: maintain designated waste collection areas onsite; locate containers in a covered area and/or in a secondary containment; provide adequate numbers of covered containers to keep rain out or prevent loss of wastes during windy conditions; arrange for regular waste collection before containers overflow; plan for additional containers and more frequent pickups during the demolition phase; collect site trash daily; promptly remove litter from erosion and sediment control devices; do not dispose of toxic liquid wastes and chemicals in dumpsters designated for construction debris; assure that waste is disposed of only at authorized disposal areas; and train personnel in proper solid waste management.

2.6.1.8 Minimizing Construction Impacts to Cultural Resources

Archaeological monitoring of ground disturbing activities is implemented at MCB Hawaii installations whenever there is a potential for such activities to encounter subsurface archaeological resources and/or human skeletal remains. Ground disturbing activities include any actions with the potential to disturb the surface of the ground or anything below that surface, such as demolition, heavy equipment excavation and earth moving, utility trenching, among others. The proposed facilities improvements would be reviewed and ground disturbing activities would be monitored by professional field archaeologists.

During the development of Mokapu Peninsula for Naval Air Station (NAS) Kaneohe Bay and later for MCAS Kaneohe Bay circa 1940 to 1965, it was common for beach sand to be excavated from shoreline areas and used for padding material under concrete building foundations and at the bottom of utility trenches. This excavated beach sand used as padding or fill material is known to contain native Hawaiian human skeletal remains. Thus, ground disturbing activities proposed for the MCB Hawaii Kaneohe Bay installation are monitored by archaeologists in order to minimize, mitigate, or avoid impacts to human skeletal remains that may be encountered in sand fill.

2.6.2 HEALTH AND SAFETY ISSUES

A number of health and safety issues would be addressed as part of the proposed action through management measures prior to construction—during planning and design of the proposed facilities. These are covered in Section 2.6.2.1. The handling of hazardous materials and waste during the squadrons' training and readiness operations would be addressed through the management measures described in Section 2.6.2.2.

2.6.2.1 Siting, Planning, and Design Standards

All improvements would be planned and designed to comply with applicable standards intended to protect health and safety; for example, restrictions on development in flood zones and certain seismic zones. As required, facilities would be sited to comply with restrictions regarding separation distances and clearances applicable to:

- Ordnance storage and handling: ordnance ESQD arcs.
- Aviation operations: runway clear zones.
- Transmitter facilities: electric and magnetic fields (EMF).
- Firing ranges: live fire range surface danger zones (SDZ).
- Anti-terrorism/force protection (AT/FP): building setback distances, as well as building design to withstand blasts (hardening).

In addition, projects would be accomplished, to the extent practicable, to meet environmental standards intended to manage storm water runoff, potable water use, and energy use, including the implementation of LID design. Planning and design elements would be incorporated to qualify for Leadership in Energy and Environmental Design (LEED)[21] Silver certification.

2.6.2.2 Hazardous Materials and Waste Management During Operations

The squadrons would comply with MCB Hawaii's required procedures for the handling of hazardous materials and waste during operations both on and off the base. MCB Hawaii has a comprehensive Hazardous Waste Management Plan, which includes chapters covering both on-site and off-site waste accumulation and disposal procedures. Two-day *Environmental Awareness* classes are held quarterly. One of the topics on the first day of training includes spill reporting and response procedures. The second day is specific to hazardous materials and hazardous waste accumulation and disposal. MCB Hawaii neither stores nor transports any hazardous waste. The base accumulates hazardous waste no longer than 90 days. An Environmental Protection Agency (EPA) licensed transporter is contracted to send the waste to a permitted Treatment Storage and Disposal Facility.

Examples of training and management practices include the following:

- Training is provided on procedures for weekly self inspections of used oil and waste at satellite accumulation sites.

[21] LEED is a program of the U.S. Green Building Council.

- "Universal Waste" training is provided regarding the use of all types of batteries, fluorescent light bulbs, and some mercury containing devices.
- MCB Hawaii Environmental Department inspectors use the same 35-item checklist that covers all federal and DOH requirements.
- Each Satellite Accumulation Site has a copy of the HW Management Plan.
- The chapters in the plan are numbered to match the inspection checklist, which covers federal requirements for workers who handle HM to be assigned their duties in writing by their own command, and they are required to have specific training within six months of assignment.
- The workers' training certificates and waste disposal records must be kept for three years.
- An updated point of contact list for the 45 Satellite Accumulation Sites is maintained by the MCB Hawaii Environmental Department.

2.6.3 TRAINING ACTIVITIES

The Marine Corps squadrons would comply with existing SOPs applicable to the specific Marine Corps, Army, and Navy training areas. These SOPs require protective measures during training operations to avoid or minimize impacts with regard to protected species, critical habitat, wildland fire, invasive species, BASH, cultural resources, and hazardous materials and waste, among others. While operating at the Army training areas on Oahu and at PTA, the squadrons would implement minimization and avoidance measures outlined in the following Biological Opinions: *Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division U.S. Army Installations, Island of Oahu* (USFWS 2003); and *Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division U.S. Army Installations, Island of Hawaii* (USFWS 2003).

2.7 SCREENING OF ISSUES AND RESOURCES

To streamline this EIS as well as to provide focus to the analysis, issues and resources were screened for relevance and potential significance. The objective of this screening was to determine which issues and associated effects on resources identified through scoping are most relevant to the proposed action and of greatest concern to the public. Issues of less relevance or importance are considered only briefly to explain why more study is not warranted. This approach is consistent with NEPA and the *United States Marine Corps National Environmental Policy Act (NEPA) Manual* (USMC 2009), which specify the following: (1) EISs will be analytic rather than encyclopedic and kept concise, (2) impacts will be discussed in proportion to their potential significance, and (3) length should vary first with potential environmental issues and then with project scope.

A comprehensive list of potential issues and impacts is presented in Table 2-9. For each issue or resource, a rationale is given on whether or not it receives in-depth evaluation in this EIS. Because the proposed action would occur at multiple locations, a determination of whether an issue is carried forward for detailed analysis is given for each location. Hence, it is possible that an issue may be considered important for one place and not relevant for another.

Certain issues are not carried forward for more study because they are addressed by measures mandated by statute, regulation, executive order, Marine Corps SOPs[22], permit conditions, BMPs, or other governmental requirement. A discussion of these protective management measures or constraints is presented in Section 2.6. These requirements are incorporated into the proposed action and alternatives when applicable. Regulatory and operational requirements are also discussed in subsequent chapters as they apply to each resource or issue.

Criteria used to determine the appropriate level of analysis include but are not limited to the following: whether an effect is expected to spill over beyond the boundaries of a DoD installation or training area, the geographic extent and duration of anticipated effects, the intensity of effects, and level of uncertainty and/or controversy. In addition, the use of facilities such as certain State of Hawaii airports and DoD airfields would be routine and not require further environmental analysis.

The following categories were applied for each issue/resource and each location:

FA = Further analysis required; carried forward for more study.

MM = Impacts addressed by compliance with management measures: regulatory or statutory requirements, BMPs, SOPs, engineering design.

NA = No further analysis required; no construction is proposed; little or no change in conditions.

[22] Other DoD training areas such as PTA and PMRF may require compliance with their installation-specific SOPs.

Table 2-9. Screening of Issues and Resources

Existing Environment Component	Potential Impact/Issue	MCBH KB	MCTAB	East Range, Kawailoa, Kahuku Training Areas	Dillingham Airfield	PTA	PMRF	MTSF	Kalaupapa Airport	HIARNG
Land Use	Compatibility with nearby land use	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Aesthetics, visual resources	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Quality of built environment	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Land ownership	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Public access	FA	NA	NA	NA	NA	NA	NA	NA	NA
Airspace	Restriction of airspace from commercial or public use to accomplish military training and operational requirements	FA	FA	FA	FA	FA	FA	FA	FA	FA
Air Quality	Aircraft emissions	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Vehicular traffic emissions	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Fugitive dust and emissions during construction	MM	MM	NA	NA	MM	NA	NA	NA	NA
	Power plant emissions	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Greenhouse gas emissions	FA	FA	FA	FA	FA	FA	FA	FA	FA
Noise	Aircraft noise impacts on off-installation sensitive receptors	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Impacts from other mobile or stationary noise sources	MM	MM	NA	NA	MM	NA	NA	NA	NA
Geology, Soils, Topography	Topographic conditions	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Soil stability and erosion potential	MM	MM	NA	NA	NA	NA	MM	NA	NA
	Prime farmland; conformance with Farmland Protection Policy Act	NA	NA	NA	NA	NA	NA	NA	NA	NA
Drainage, Hydrology, Water Quality	Increased runoff due to additional impermeable areas	MM	NA	NA	NA	NA	NA	MM	NA	NA
	Surface water quality impacts during construction	FA	FA	NA	NA	FA	NA	FA	NA	NA

Table 2-9. Screening of Issues and Resources

Existing Environment Component	Potential Impact/Issue	MCBH KB	MCTAB	East Range, Kawailoa, Kahuku Training Areas	Dillingham Airfield	PTA	PMRF	MTSF	Kalaupapa Airport	HIARNG
	Groundwater quality impacts during construction	MM	MM	NA	NA	MM	NA	MM	NA	NA
	Groundwater quality impacts during operations	MM	MM	MM	MM	MM	MM	MM	MM	MM
	Aquifer recharge potential	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological Resources	*Threatened, endangered, candidate species*	*FA*	*FA*	*FA*	*FA*	*FA*	*FA*	*FA*	*FA*	*FA*
	Migratory birds	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Marine mammals	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Critical habitat	NA	NA	FA	FA	FA	FA	NA	FA	NA
	Wetlands	FA	FA	FA	FA	FA	NA	NA	NA	NA
	Coral reefs	FA	FA	NA	NA	NA	NA	NA	NA	NA
	Bird Air Strike Hazard (BASH)	MM	MM	MM	MM	MM	MM	MM	MM	MM
	Light emissions	MM	NA	NA	NA	NA	NA	NA	NA	NA
	Invasive species	MM	MM	MM	MM	MM	MM	MM	MM	MM
Cultural Resources	Historic buildings (listed or eligible for listing in the NRHP)	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Archaeological resources	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Cultural sites	FA	FA	FA	FA	FA	FA	FA	FA	FA
Safety/Env Health	Natural hazards	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Hazardous materials/waste	MM	MM	MM	MM	MM	MM	MM	MM	MM
	Airfield safety	MM	MM	MM	MM	MM	MM	MM	MM	MM
	Aircraft safety	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Bird aircraft strike hazard	MM	MM	MM	MM	MM	MM	MM	MM	MM
	Wildland fires	MM	MM	MM	MM	MM	MM	MM	MM	MM
	Ordnance safety	FA	FA	FA	NA	FA	FA	NA	NA	FA

Table 2-9. Screening of Issues and Resources

Existing Environment Component	Potential Impact/Issue	MCBH KB	MCTAB	East Range, Kawailoa, Kahuku Training Areas	Dillingham Airfield	PTA	PMRF	MTSF	Kalaupapa Airport	HIARNG
Socio-economics	Demographic	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Housing	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Employment and wages	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Labor force impacts	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Fiscal impacts	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Community organization	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Public facilities and services	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Environmental justice	FA	FA	FA	FA	FA	FA	FA	FA	FA
	Protection of children	FA	FA	FA	FA	FA	FA	FA	FA	FA
Infrastructure	Roadways and vehicular traffic	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Public transit	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Potable water	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Wastewater treatment	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Solid waste disposal	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Electrical generation, energy conservation	FA	NA	NA	NA	NA	NA	NA	NA	NA
	Telephone, internet, cable TV service	FA	NA	NA	NA	NA	NA	NA	NA	NA
Energy Use		FA	FA	FA	FA	FA	FA	FA	FA	FA

2.8 CRITERIA FOR EVALUATING IMPACTS AND THEIR SIGNIFICANCE

Criteria for evaluating the significance of potential impacts are specified in 40 Code of Federal Regulations (CFR) 1508.27:

"Significantly" as used in NEPA requires considerations of both context and intensity:

> (a) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.
>
> (b) Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:
>
> 1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.
> 2. The degree to which the proposed action affects public health or safety.
> 3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
> 4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
> 5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
> 6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
> 7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment." [23]

Chapter 6 presents a summary of potential environmental impacts for each alternative analyzed in this document. Included in the summary is the extent of potential environmental impacts disclosed for each resource area at each installation/training area under each alternative. Mitigation is required for certain impacts, which the Marine Corps is responsible for implementing. In addition, the Marine Corps is responsible for agency consultations to develop measures needed to protect significant cultural resources and listed species. As discussed in Section 2.5, the Marine Corps is also responsible for implementing measures to protect the environment during construction activities and to protect human health and safety during all phases of the proposed action.

[23] 43 FR 56003, Nov. 29, 1978; 44 FR 874, Jan. 3, 1979

CHAPTER 3

MCB Hawaii Kaneohe Bay Affected Environment and Environmental Consequences

CHAPTER 3

MCB Hawaii Kaneohe Bay
Affected Environment and Environmental Consequences

3.1 INTRODUCTION

Chapter 3 describes the affected environment (existing or baseline conditions) at Marine Corps Base (MCB) Hawaii Kaneohe Bay, discloses potential environmental consequences of each alternative expected with full implementation of the proposed action in 2018, and proposes mitigation measures (if needed) for the issues/resource listed below at MCB Hawaii Kaneohe Bay. The potential impacts of training operations and any improvements to facilities outside of MCB Hawaii Kaneohe Bay are presented in Chapter 4.

- Land use
- Airspace
- Air quality
- Noise
- Geology, soils, and topography
- Drainage, hydrology, and water quality
- Biological resources
- Cultural resources
- Safety and environmental health
- Socioeconomics
- Infrastructure
- Energy Use

The focus of Chapter 3 is on potential impacts of the proposed basing at MCB Hawaii Kaneohe Bay, including two aviation facility alternatives (Alternative A and B) and the No Action Alternative. Alternatives A and B vary by development footprint, layouts, and locations of aircraft apron and hangars, as well as differences in development of the bachelor enlisted quarters (BEQ). The number of active duty personnel, dependents, and civilian employees and contractors associated with the squadrons would be the same under Alternative A and Alternative B. The No Action Alternative assumes no Marine Medium Tiltrotor (VMM) or Marine Light Attack Helicopter (HMLA) squadrons based at MCB Hawaii Kaneohe Bay in the 2018 planning horizon and no construction of facilities to support the squadrons.

In this chapter, two items are identified in the introduction for each resource/issue section: (1) factors considered in evaluating impacts, including but not limited to applicable statutes and regulations, and whether the alternative being evaluated would result in a net change to existing conditions; and (2) the region of influence (ROI), that is, the geographic extent being evaluated for each resource area. The ROI may vary for each issue/resource area, as well as for direct versus indirect impacts.

3.2 LAND USE

3.2.1 INTRODUCTION

Section 3.2 addresses the following: compatibility with nearby land uses, aesthetics/visual resources, quality of the built environment, land ownership, and public access. As a general matter, the federal government is not subject to state or county land use plans, laws, or regulations on its military reservations unless specifically required by Congress. As applicable, federal agencies consider local land use laws and regulations to avoid conflicts.

Aircraft noise is the main land use compatibility issue. Aircraft operations at MCB Hawaii Kaneohe Bay would be the same under Alternatives A and B and would differ under the No Action Alternative. With different development footprints, Alternatives A and B would have different visual impacts. No differences are anticipated between alternatives in quality of the built environment, land ownership, or public access.

Land use is connected to other resource areas, which are analyzed separately in this document. For example, land use compatibility as it relates to noise, is summarized in this section; however, a detailed analysis of noise impacts is presented in Section 3.5.

Aesthetics addresses whether alternatives would change views from surrounding communities. View plane or viewshed analysis considers views from public roadways, parks and recreation areas (for example, trails), and/or scenic lookouts.

Quality of the built environment considers whether construction proposed in the alternatives would be consistent with existing building functions, design, and standards. The historic significance of the built environment is addressed in Section 3.9. Land ownership and public access consider ownership of the land on which the proposed action is to occur, and whether any of the alternatives would decrease existing public access to the shoreline, upland trails or recreation areas, or cultural sites within the ROI.

For the analysis of land use impacts associated with the basing of the VMM and HMLA squadrons at MCB Hawaii Kaneohe Bay, the ROI includes the base itself and portions of the Koolaupoko district of the island of Oahu surrounding the base. This is generally Section 2, Kaneohe, and Section 3, Kailua, as identified in the Koolaupoko Sustainable Communities Plan (DPP 2000), and extends from Heeia to Lanikai (and includes these two communities). See Figure 3-1. The exception to this is the definition of ROI for land ownership. In this case, the ROI is MCB Hawaii Kaneohe Bay—the land on which the proposed basing would occur.

3.2.2 AFFECTED ENVIRONMENT

This section describes existing or baseline conditions within the ROI, which generally includes MCB Hawaii Kaneohe Bay and the communities of Kaneohe and Kailua. For land ownership, the ROI is MCB Hawaii Kaneohe Bay. The following are described: land use and the noise environment, views of base from other parts of the region, the base's built environment, and land ownership of the base. Section 3.2.3 discusses potential changes to these conditions that could result from implementation of either Alternative A or B and the No Action Alternative.

Land Use and the Noise Environment

MCB Hawaii Kaneohe Bay, situated on Mokapu Peninsula, is geographically separated from the population centers of Kailua and Kaneohe. Areas of undeveloped land, as well as Kailua and Kaneohe Bays, serve as buffers between the base and these Windward Oahu communities. As shown in Figure 3-1, nearby land uses include primarily low-density residential and open space/preservation. Commercial centers and some medium-density residential uses are located at Kailua town and along Kamehameha Highway in Kaneohe.

Other uses include agriculture, parks and golf courses, and institutional facilities such as Windward Community College and the University of Hawaii Institute of Marine Biology in Kaneohe Bay. These land uses are not expected to substantially change. The City and County of Honolulu's (City's) *General Plan* (DGP 2002) designates the Kaneohe and Kailua communities as residential areas with limited future population growth.

A study was conducted to evaluate potential noise impacts associated with introduction of the MV-22 and H-1 aircraft (see Appendix D for more details). The existing noise environment in the ROI as it relates to land use compatibility is summarized here. See Section 3.5, Noise, for an explanation of noise descriptors such as Day-Night Average Sound Level (DNL).

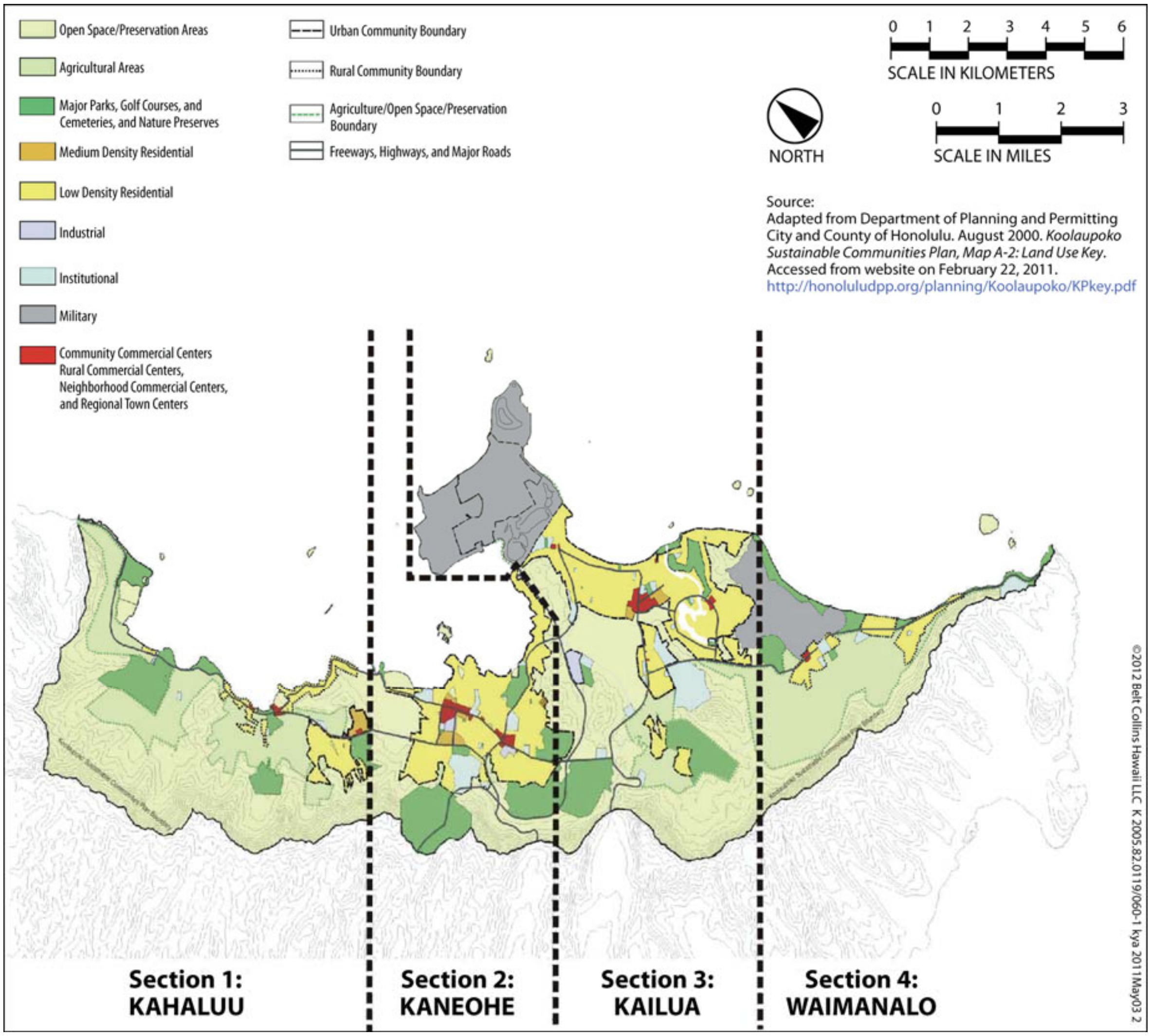

Figure 3-1. Koolaupoko Land Use

Noise measurements related to aircraft operations to define the area of noise impact are expressed in terms of DNL. The DNL represents cumulative sound levels that account for the exposure of all noise events in a 24-hour period. In order to account for increased human sensitivity to noise at night, DNL includes a 10 dB penalty for nighttime events (2200 to 0700 hours). The U.S. Department of Defense (DoD) has established noise compatibility criteria for various land uses. According to these criteria, sound levels up to 65 decibels[1] (dB) DNL are compatible with land uses such as residences, transient lodging, and medical facilities.

Noise levels at MCB Hawaii Kaneohe Bay are expressed as 55 to 85 dB DNL contours, in 5 dB increments. The types of land uses (outside of MCB Hawaii Kaneohe Bay) currently within the 65 dB DNL are open space/preservation. Existing noise contours and those associated with each alternative are presented in Section 3.5 (Noise), along with a discussion of potential impacts.

Aesthetics/Visual Resources

The Koolaupoko Sustainable Communities Development Plan referenced above identifies important views from stationary points (see Figure 3-2).[2] These include views from the shoreline (for example, from public beach parks) looking toward the ocean, along the shoreline, and toward the mountains, as well as views from upper valley and mountain areas. Views from the mountains are mainly from scenic lookouts off highways and from public trails. MCB Hawaii Kaneohe Bay is visible from many or most of the viewpoints. Located on a peninsula with features such as Ulupau Head, the runway, and the ponds, the base is a prominent part of the Windward Oahu viewshed. Figure 3-2 also identifies continuous views, for example, from Kaneohe Bay and Kailua Bay, and intermittent views. The views offer a mix of natural features and developed areas, with predominant ocean and mountain vistas. Views from MCB Hawaii Kaneohe Bay are expansive, offering vistas of the mountains and the surrounding ocean.

Quality of the Built Environment

The built environment at MCB Hawaii Kaneohe Bay is characterized by base operations facilities (administrative, training, and industrial uses), low and medium density housing, and community support facilities (commercial, recreational, administrative, and industrial uses). The airfield and associated hangars and other buildings occupy a major portion of the developed part of the base. Other than the hangars with high bays and several other structures, building heights at MCB Hawaii Kaneohe Bay generally do not exceed five stories.

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1 Noise and sound are expressed in decibels. For example, normal speech has a sound level of approximately 60 dB. See Section 3.5.1 for additional examples.

2 Although this map shows various land uses at MCB Hawaii Kaneohe Bay, the entire base is in military use.

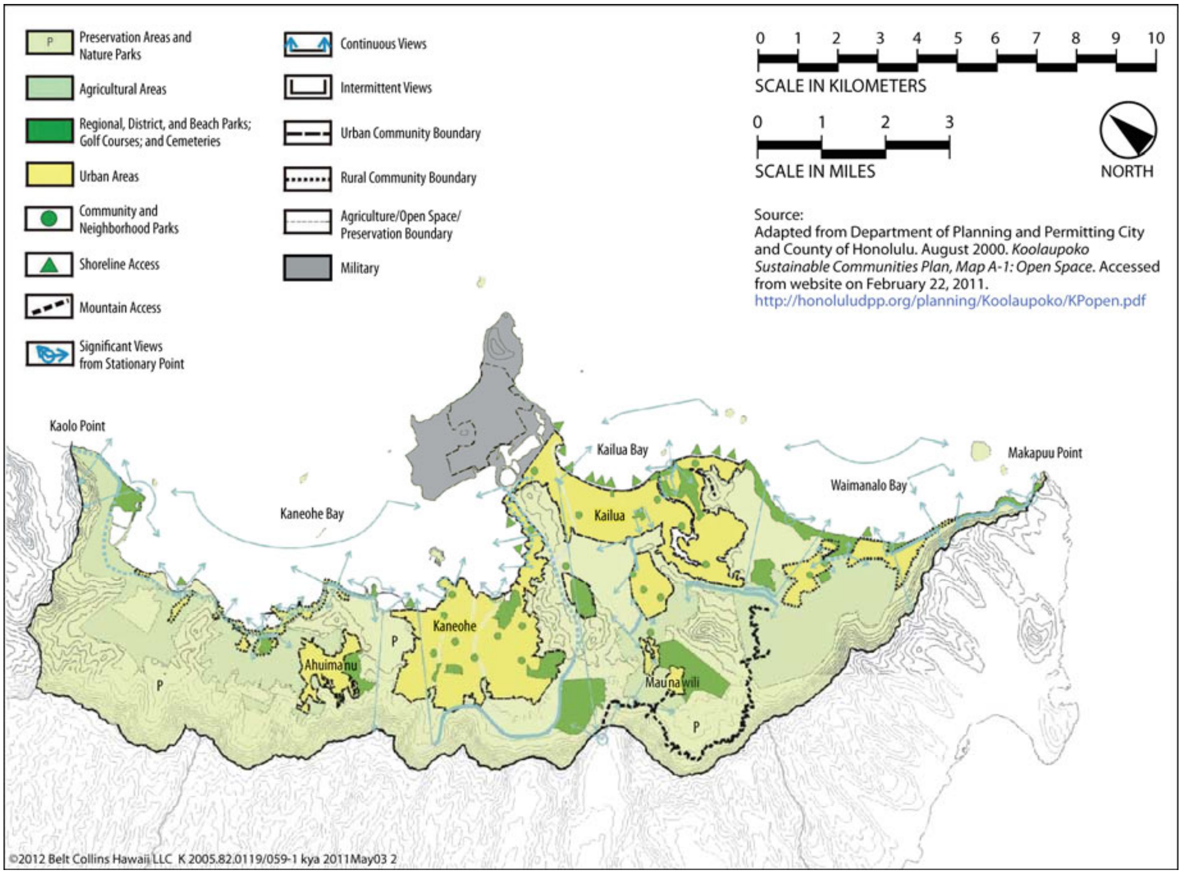

Figure 3-2. Koolaupoko Views

Land Ownership

All land at MCB Hawaii Kaneohe Bay is owned in fee by the United States (U.S.) government.

Public Access

As with many U.S. military bases, access to the public is limited due to security requirements. Under the Sikes Act (16 U.S. Code [U.S.C.] 670a-670f, as amended), all military installations with significant natural resources must provide appropriate access to "public trust natural resources" under their jurisdiction in such manner and extent as to not compromise security, operational effectiveness, and/or integrity or sustainability of the natural resources accessed. MCB Hawaii Kaneohe Bay has a well-established natural resources outreach program that has provided access to thousands of members of the public (both individually and in groups) to public trust resources. This public access program is focused primarily on accomplishing environmental enhancement objectives, for example, nature tours, ecology camps, bird counts, nesting habitat enhancement, and weed removal service projects. In addition, the base operates a limited public fishing program.[3]

Access is also provided for religious ceremonies and practices. The American Indian Religious Freedom Act of 1978, amended in 1994, states that "it shall be the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites."

The community is invited to visit the base for special events, such as the annual BayFest and other smaller events, as well as athletic events. Public events include air shows, job fairs, the Battle Color Detachment demonstration, the Swamp Romp, "The Beast" 10-kilometer run, and the Centurion Bike Race. In addition, the base provides case-by-case access to Native Hawaiian organizations (NHO) and individual Native Hawaiians recognized as culturally affiliated with human remains buried at Mokapu. When NHO members request access for a visit, one of the base's Cultural Resources Managers or the Environmental Director serves as the sponsor, in accordance with base access rules.

3.2.3 ENVIRONMENTAL CONSEQUENCES

Land Use Compatibility and the Noise Environment

There is a potential for certain nearby land uses to be affected by aircraft noise. However, as discussed in Section 3.5, noise contours representing the proposed action would remain similar in size when compared to contours for the No Action Alternative. Existing noise sensitive land uses in the surrounding civilian community currently exposed to aircraft noise levels greater than 65 dB DNL would continue to be exposed to similar noise levels. DoD's acceptability threshold for noise sensitive land uses would not be exceeded in the surrounding civilian communities (see Section 3.5). The increases in future aircraft noise levels associated with introduction of the MV-22 and AH/UH-1 aircraft are expected to be minimal and would be difficult to measure or discern due to the lower noise levels of these aircraft when compared to other aircraft operating at MCB Hawaii Kaneohe Bay. No mitigation is required for any of the alternatives.

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[3] Further details are provided in section 7.6 of MCB Hawaii's 2001 Integrated Natural Resources Management Plan (INRMP) and Environmental Assessment (Drigot, Wilcox, and Duin 2001) and in the same section of the 2006 INRMP Update (MCBH 2006a).

Aesthetics/Visual Resources

Under Alternative A or B, the proposed action would involve demolition, construction of new facilities, and reuse/renovation of existing facilities to support the new VMM and HMLA squadrons proposed for permanent basing at MCB Hawaii Kaneohe Bay. See Chapter 2, Proposed Action and Alternatives, for more details on the projects, as well as Section 3.9, Cultural Resources, for a discussion of historic properties proposed for demolition, reuse, and renovation. The number of facilities proposed for demolition would be 27 in Alternative A and 32 in Alternative B. The number of square feet (SF) of demolished facilities would be approximately 352,000 SF in Alternative A and 317,000 SF in Alternative B. After construction of new/expanded facilities, there would be a net increase of approximately 640,000 SF under Alternative A and 622,000 SF under Alternative B. Most of this difference is attributed to the different demolition/construction scenarios for the BEQs and the VMM squadron facilities.

The main difference between Alternatives A and B relative to views would be the siting of MV-22 facilities on different sides of the runway. Development of new BEQs would differ in terms of number of existing BEQ buildings demolished (6 in Alternative A, 4 in Alternative B) and heights of the new BEQs (4 stories in Alternative A, 6 stories in Alternative B). The different views of the base due to the MV-22 and BEQ facilities would be barely discernable from off-base viewpoints. The MV-22 hangars would be consistent in appearance with existing aviation facilities surrounding the runway, and the BEQs are in a developed area. The appearance of the base and of the new and renovated facilities from various off-base viewpoints would be similar to existing conditions. New buildings would be designed to be consistent with existing buildings. Under No Action, there would be no changes in appearance and, hence, no visual impacts. No mitigation is required for any of the alternatives.

Views of the base also include aircraft landing and taking off. Aviation activities at Kaneohe include both home based and transient helicopter and fixed wing aircraft. Addition of the MV-22 and H-1 aircraft under Alternative A or B could affect views of the base. The change would occur over several years as the squadrons arrive, increasing the number of landings and takeoffs. Views of aircraft would be consistent with the operations of a working air base. There would be no change in views of aircraft with the No Action Alternative. No mitigation is required for any of the alternatives.

Views of the ocean and mountains from the base would be subject to minimal change by the development proposed in Alternative A or B. Heights of the new facilities would not exceed existing building heights elsewhere on the base. Many of the proposed projects involve replacement or relocation of existing facilities. Views from the base would remain unchanged under No Action. No mitigation is required for any of the alternatives.

The proposed action would be consistent with the Coastal Zone Management (CZM) Act scenic and open space resource objective to "protect, preserve and where desirable, restore or improve the quality of coastal scenic space resources." In particular, the proposed action is consistent with the CZM policy to "insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline."[4]

Quality of the Built Environment

As stated above, the proposed facilities at the base under Alternative A or B would be consistent in design and appearance with existing facilities. See Section 3.9, Cultural Resources, for an analysis of proposed changes to the appearance of historic properties. With the No Action Alternative, there would be no impacts.

Land Ownership

Land ownership of the base would not change under either of the action alternatives or with the No Action Alternative. No mitigation is required.

Public Access

Neither the action alternatives nor the No Action Alternative would result in a change in public access to the base. No mitigation is required.

Summary

Land use impacts at MCB Hawaii Kaneohe Bay associated with the proposed action would occur during operations; no impacts are expected during construction.

Changes in aircraft noise levels at noise sensitive areas would be small. Given no difference in aircraft operations in Alternatives A and B, land use compatibility impacts due to aircraft noise would be the same. With the No Action Alternative, there would be minimal changes in aircraft noise levels.

The appearance of the base would change from various viewpoints, but the views would generally be similar to existing conditions. Slight differences in views of the base between

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[4] Hawaii CZM Program Federal Consistency Assessment Form

Alternatives A and B would be barely discernable. Proposed on-base development would not significantly affect views from the base.

There would be little or no change in quality of the built environment, as proposed facilities in both Alternatives A and B would be consistent in design to existing facilities. No changes are expected with the No Action Alternative.

Land ownership and public access would remain unchanged with all alternatives.

3.3 AIRSPACE

3.3.1 INTRODUCTION

This section provides information on airspace at Marine Corps Air Station (MCAS) Kaneohe Bay and its use by the Marine Corps and others for aviation training. Airspace is an area of defined dimensions within which air traffic control service is provided to instrument and visual flights in accordance with airspace classification. The National Airspace System is under the control of the Federal Aviation Administration (FAA) through the Federal Aviation Act of 1958. The FAA is responsible for the safe and efficient use of U.S. airspace by military and civilian aircraft and for supporting national defense requirements. Airspace is divided into two major categories: controlled and uncontrolled. Within these categories are subcategories that designate classes of airspace use (FAA 2011). Controlled airspace is that airspace within which all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements. Further information on airspace is presented in Appendix C.

This section describes existing aircraft operations at MCAS Kaneohe Bay and evaluates changes that would occur with introduction of the new squadrons compared to the No Action Alternative in 2018. As these data are used to evaluate other resources such as air quality and noise, the approach used to characterize aircraft operations for the three scenarios (existing or baseline conditions in 2009, proposed action in 2018, and No Action Alternative in 2018) are described herein.

The existing environment is represented by the “baseline scenario,” which reflects 2009 MCAS Kaneohe Bay aircraft activity for the following aircraft: CH-53D helicopters, H-60 helicopters, P-3 turboprop airplanes, C-20 jet transport, and other transient aircraft operations. The proposed action—introduction of the MV-22 and AH-1/UH-1 aircraft operations—is represented by Alternatives A and B in this Environmental Impact Statement (EIS), but for purposes of aviation operations, the two action alternatives are identical and can simply be referenced as the proposed action. The year 2018 is the timeframe in which full implementation of the proposed action is projected. For the airfield environment at MCAS Kaneohe Bay, other changes planned under separate actions include the transition of existing CH-53D helicopters to CH-53E helicopters, transition of most of the P-3 aircraft to P-8 aircraft, and modifications (relative to the baseline condition) of other based and transient aircrafts' (e.g., KC-130) tempo of operations.

The No Action Alternative reflects a future baseline environment in 2018 consisting of reasonably foreseeable conditions at that time but without introduction of the MV-22 and AH-1/UH-1 aircraft. In addition, the No Action Alternative includes other activities independent of the proposed action. These activities include transition of the CH-53D helicopters to CH-53E helicopters, the transition of most of the P-3 aircraft to P-8 Aircraft, and modifications of other based and transient aircrafts' tempo of operations, relative to the baseline condition. For comparison purposes, differences between the proposed action and the No Action Alternatives represent the potential impacts of the proposed action.

3.3.2 AFFECTED ENVIRONMENT

The airspace associated with MCAS Kaneohe Bay is under the control of the Kaneohe Approach Control. This allows the base to separate general public use of airspace in this area from hazards associated with military training and operations. The airspace for MCAS Kaneohe Bay is designated Class D. This airspace, which defines the ROI, is for the control of visual flight rules (VFR) air traffic. It is within a 4.3-nautical mile (NM) (8-kilometer [km]) radius of the center of the airfield, extending from the surface up to 2,500 ft (762 m) above ground level (AGL). Instrument flight rules (IFR) control is under Kaneohe Approach Control. The Terminal Approach Control airspace extends out to 35 NM (65 km) north of the airfield up to an altitude of 9,000 ft (2,743 m). Kaneohe Approach Control is also responsible for air traffic within the MCAS Terminal Approach Airspace (NAVFAC PAC 2006).

Training areas include the runway, a painted paved surface to simulate a Landing Helicopter Assault (LHA) ship deck located at West Field for Field Carrier Landing Practice (FCLP) and externals (i.e., lifting cargo), several helipads also at West Field, 101 helipad, and several landing zones (LZs) throughout the base (Figure 2-3 and Figure 2-8). The LZs are Boondocker, Eagle, GP 216, and Rifle Range.

Of the four LZs, Boondocker (located at the southeast part of the base) is used for tactical training (a pickup/drop off area for transporting troops to Marine Corps Training Area Bellows (MCTAB) and other training areas throughout Hawaii), while the others are for administrative use. Administrative LZs are those that are occasionally used, such as for VIP pickup/drop off or medical evacuation. No routine training activities occur at administrative sites; the training is therefore not quantified in this analysis. Tactical LZs would be used for conducting training activities, such as confined area landings (CALs), insert/extract, etc. See Section 2.4.2.3 for descriptions of training activities. The only tactical training LZ at MCB Hawaii Kaneohe Bay is LZ Boondocker, where 288 annual baseline (2009) operations occur.

Table 3-1 provides a summary of existing activities and number of flight operations at MCAS Kaneohe Bay. Terms used to describe the various activities follow.

Table 3-1. 2009 Aircraft Operations at MCAS Kaneohe Bay[3]

Aircraft	Departures	Non-Break Visual Arrival	Instrument Arrival (TACAN)	Overhead Break Arrival	Touch and Go[1]	GCA Box	TOTAL
Based							
P-3C	3,220	2,493	728		12,799	949	20,189
H-60	597	597			8,139	99	9,432
Based and Transient							
CH-53D	1,639	1,586	53		9,905	401	13,584
C-20	939	818	121		216	168	2,262
Transient							
C-17	611	377	236		4,134	91	5,449
C-5, AN-124, Other Large Jet	93	89	7				189
Propeller (C-130, C-26, P-3)	337	327	10		163	163	1,000
Medium Jet (B-757, B-737, C-9)[2]	15	15					30
4th Force Reconnaissance[2]	6	6					12
Fighter/Attack	254	1	238	16	13		522
TOTAL	7,711	6,309	238	16	35,369	1,871	52,669

Source: Wyle Laboratories. March 2012. *Aircraft Noise Study for Marine Corps Base Hawaii, Kaneohe Bay, Hawaii.* WR 11-08.
1 Field Carrier Landing Practice (FCLP) is included.
2 Operations were not modeled for noise.
3 Aviation operation counts at West Field and 101 helipad are included in the airfield runway counts from the air traffic control tower.

An aircraft **flight operation** refers to any takeoff or landing at MCAS Kaneohe Bay. The takeoff or landing may be part of a training maneuver or pattern, such as touch-and-go, or associated with a departure or arrival of aircraft. A takeoff or landing counts as one operation. A pattern usually consists of two operations.

Arrival. An aircraft gradually descends, lands, comes to a stop, and then taxis off the runway.

Departure. An aircraft takes off to a training area or as part of a training maneuver (i.e., touch and go).

Overhead Break Arrival. This is an expeditious arrival using VFR. An aircraft approaches the runway 500 feet (ft) (150 meters [m]) above the altitude of the landing pattern. Approximately halfway down the runway, the aircraft performs a 180-degree turn to enter the landing pattern. Once established in the pattern, the aircraft lowers landing gear and flaps and performs a 180-degree descending turn to land on the runway.

Touch and Go. An aircraft lands and takes off on a runway without coming to a full stop. After touching down, the pilot immediately goes to full power and takes off again. The touch and go is counted as two operations because the landing is counted as one operation and the take-off is counted as another.

Field Carrier Landing Practice (FCLP). An aircraft practices simulated aircraft carrier landing. FCLPs are required training for all pilots before landing on a carrier. The FCLP is counted as two operations because the landing is counted as one operation and the take-off is counted as another.

Ground Controlled Approach (GCA). This is a radar or "talk down" approach directed from the ground by air traffic control (ATC) personnel. ATC personnel provide pilots with verbal course and glide slope information, allowing them to make an instrument approach during inclement weather. The GCA is counted as two operations because the landing is counted as one operation and the take-off is counted as another.

Low Approach. This is an approach where the pilot does not make contact with the runway. This is used during maintenance check flights, hover work, and any other training operations conducted at less than 50 ft (15 m) above ground level and lasts, on average, seven minutes.

3.3.3 ENVIRONMENTAL CONSEQUENCES

Construction

With the proposed construction projects at MCB Hawaii Kaneohe Bay associated with Alternatives A and B (see Chapter 2), no airspace conflicts would occur, i.e., construction of new facilities would not affect navigable airspace. Therefore, no impacts from construction activities would occur. Under the No Action Alternative, with no construction, there would be no construction-related impacts on airspace.

Operational Impacts

MCAS Kaneohe Bay provides a training environment that comprises airspace, land, and water areas. The types of training activities would be similar to existing operations at the airfield and LZs, with an increase in tempo (frequency of operations) given the introduction of new squadrons. Table 3-2 shows the proposed 2018 annual operations of the new squadrons at MCAS Kaneohe Bay. Fiscal year 2018 (FY2018) is when the projected personnel increases and delivery of the aircraft would be fully implemented.

Table 3-2. 2018 Proposed Annual Operations Under Alternatives A/B at MCAS Kaneohe Bay

Aircraft	Departures	Non-Break Visual Arrival	Instrument Arrival (TACAN)	Overhead Break Arrival	Touch and Go[1]	GCA Box	TOTAL
Based							
P-8 MMA	1,334	1,332	1		14,230	6,112	23,009
P-3C	576	461	114		2,020	149	3,320
H-60	545	545			7,434	90	8,614
MV-22	2,545	1,247	1,298		1,859	1,025	7,974
AH-1/UH-1	2,817	2,727	91		7,749	852	14,236
Based and Transient							
CH-53E	1,065	1,031	34		6,442	260	8,832
C-20	790	789			1,028	1,553	4,160
Transient							
C-17	611	547	66		4,132	90	5,446
C-5, AN-124, Other Large Jet	283	264	19				566
Propeller (C-130, C-26, P-3)	857	847	10		163	163	2,040

Table 3-2. 2018 Proposed Annual Operations Under Alternatives A/B at MCAS Kaneohe Bay

Aircraft	Departures	Non-Break Visual Arrival	Instrument Arrival (TACAN)	Overhead Break Arrival	Touch and Go[1]	GCA Box	TOTAL
Medium Jet (B-757, B-737, C-9)[2]	15	15					30
4th Force Reconnaissance[2]	6	6					12
Fighter/Attack	232	1	213	16	24		486
TOTAL	11,676	9,812	1,846	16	45,081	10,294	78,725

Source: Wyle Laboratories. March 2012. *Aircraft Noise Study for Marine Corps Base Hawaii, Kaneohe Bay,* Hawaii, WR 11-08.

1 Includes FCLP operations.

2 Operations were not modeled for noise.

Table 3-3 shows the proposed 2018 annual operations at MCAS Kaneohe Bay for the No Action Alternative.

Table 3-3. 2018 Proposed Annual Operations Under No Action Alternative at MCAS Kaneohe Bay

Aircraft	Departures	Non-Break Visual Arrival	Instrument Arrival (TACAN)	Overhead Break Arrival	Touch and Go[1]	GCA Box	TOTAL
Based							
P-8A MMA	1,334	1,332	1		14,230	6,112	23,009
P-3C	576	461	114		2,020	150	3,321
H-60	545	545			7,434	90	8,614
Based and Transient							
CH-53E	1,488	1,440	48		8,998	364	12,338
C-20	790	789			1,028	1,554	4,161
Transient							
C-17	612	546	66		4,132	90	5,446
C-5, AN-124, Other Large Jet	283	264	19				566
Propeller (C-130, C-26, P-3)	1,249	1,239	10		163	163	2,824
Medium Jet (B-757, B-737, C-9)[2]	15	15					30

Table 3-3. 2018 Proposed Annual Operations Under No Action Alternative at MCAS Kaneohe Bay

Aircraft	Departures	Non-Break Visual Arrival	Instrument Arrival (TACAN)	Overhead Break Arrival	Touch and Go[1]	GCA Box	TOTAL
4th Force Reconnaissance[1]	6	6					12
Fighter/Attack	232	1	213	16	24		486
TOTAL	7,130	6,638	471	16	38,029	8,523	60,807

Source: Wyle Laboratories. October 2011. *Aircraft Noise Study for Marine Corps Base Hawaii, Kaneohe Bay, Hawaii,* Wyle Report WR 11-08 (proposed).

1 Includes FCLP operations

2 Operations were not modeled for noise.

Under Alternative A or B, airfield operations would involve 17,918 (29%) more operations when compared to the No Action Alternative. Under the No Action Alternative, airfield operations would increase by 8,138 operations (15%) when compared to 2009 activities. While the proposed aviation operations in FY2018 would result in a large increase when compared with either the baseline condition or the No Action Alternative, this increase is within the range of past operations. Based on MCAS Kaneohe Bay air traffic control tower records since 1999, the airfield averaged 72,100 annual operations, with a peak of 90,000 operations in 2002.[5] For these reasons, no impact on airspace would occur with Alternatives A or B.

At the only tactical LZ at MCB Hawaii Kaneohe Bay, LZ Boondocker, annual aircraft operations would decrease from 288 in 2009 to 64 in 2018 under Alternative A or B. Under the No Action Alternative, annual aircraft operations would decrease from 288 in 2009 to 128 in 2018. As the number of operations in Alternatives A or B would be less than the No Action Alternative, no impact on airspace would occur.

Summary

With the proposed action (Alternative A or Alternative B), the use of existing airspace would not change; training operations would continue within the established parameters of the designated airspace and entities controlling the airspace. No changes in the use of airspace, airspace designation, or size of airspace coverage would be necessary to accommodate the increase in training as described in Table 3-2, and the increase in the tempo of operations could be managed by existing airspace managers.

[5] Hunsuker, Lt. Chad. Email to Belt Collins Hawaii. September 14, 2011.

Under the No Action Alternative, no aviation facilities improvements or additional Marine Corps aviation training would occur.

3.4 AIR QUALITY

3.4.1 INTRODUCTION

This section addresses air quality associated with the alternatives during construction and operations. There would be some difference in construction activities and impacts between the action alternatives, with development of the runway underpass proposed in Alternative B. No differences between the action alternatives are expected during operations, as aircraft and other operations would be the same or vary only slightly under Alternatives A and B.

The ROI for potential air emissions from the proposed action is the state of Hawaii because air quality is managed under one state jurisdiction and the state is in attainment of all criteria pollutants (see discussion in Section 3.4.2 below). The actual ROI with respect to emissions having a measurable impact on air quality would be substantially smaller considering the localized emission characteristics of the project sources (aircraft engines and construction related sources) and the efficient dispersive properties of the atmospheric environment. Dispersion is generally efficient in Hawaii for the following reasons: (1) prevailing trade winds conditions, and (2) infrequent inversions (inversions restrict atmospheric dispersion between the ground and the height of the inversion).

3.4.2 AFFECTED ENVIRONMENT

Regulatory Conditions

The Federal Clean Air Act of 1970 and its subsequent amendments established programs to control air pollution. One such program, the National Ambient Air Quality Standards (NAAQS) program, as implemented by the U.S. Environmental Protection Agency (EPA), provides a nationwide approach for assessing the quality of ambient air.

In general, areas meeting the standards for criteria pollutants are designated as “attainment” areas and areas not meeting the standards are “nonattainment” areas. The criteria pollutants are carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter with a nominal aerodynamic diameter of 10 microns or less (PM_{10}), particulate matter with a nominal aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), ozone, lead, and hydrogen sulfide (the latter is from the State of Hawaii [State] rules only). Standards are established for criteria pollutants to protect public health and welfare with a reasonable margin of safety. Table 3-4 presents the NAAQS, pursuant to 40 Code of Federal Regulations (CFR) Part 50, and the State of Hawaii Ambient Air Quality Standards (AAQS) as set forth in Hawaii

Administrative Rules (HAR 11-59). In Hawaii, the State Department of Health (DOH) has been delegated authority by the U.S. EPA to implement the Prevention of Significant Deterioration (PSD) program, designed to ensure that air quality does not degrade beyond the NAAQS levels or beyond specified incremental amounts above a prescribed baseline level.[6]

The state of Hawaii is in attainment of the NAAQS and also meets the State AAQS. Exceptions include exceedances of the NAAQS for SO_2 because of natural events—Kilauea volcano—and for $PM_{2.5}$ because of exceptional events—New Year's Eve fireworks. As the entire state is in attainment of the NAAQS, the emissions from the proposed action are not subject to the General Conformity Regulations, 40 CFR Parts 51 and 93, pursuant to section 176(c) of the Clean Air Act (FR April 2010).

Table 3-4. NAAQS and State AAQS

Air Pollutant	Hawaii Standard	Federal Primary Standard	Federal Secondary Standard
Carbon Monoxide			
1-hour average	9 ppm	35 ppm	None
8-hour average	4.4 ppm	9 ppm	None
Lead			
3-month average	1.5 µg/m^3 (calendar quarter)	0.15 µg/m^3 (running 3-month)	Same as primary
Nitrogen Dioxide			
1-hour average	None	100 ppb	None
Annual average	0.04 ppm	0.053 ppm	Same as primary
Particulate Matter (PM_{10})			
24-hour block average	150 µg/m^3	150 µg/m^3	Same as primary
Annual average	50 µg/m^3	None	None
Particulate Matter ($PM_{2.5}$)			
24-hour block average	None	35 µg/m^3	Same as primary
Annual average	None	15 µg/m^3	Same as primary

6 http://www.epa.gov/region9/air/permit/permitdelegation.html#part71 , accessed 22 March 2011.

Table 3-4. NAAQS and State AAQS

Air Pollutant	Hawaii Standard	Federal Primary Standard	Federal Secondary Standard
Ozone			
8-hour rolling average	0.08 ppm	0.075 ppm	Same as primary
Sulfur Dioxide			
1-hour average	None	75 ppb	None
3-hour block average	0.5 ppm	-	0.5 ppm
24-hour block average	0.14 ppm	0.14 ppm	-
Annual average	0.03 ppm	0.03 ppm	-
Hydrogen Sulfide			
1-hour average	25 ppb	None	None

ppm –parts per million
ppb – parts per billion
Source: http://hawaii.gov/health/environmental/environmental/air/cab/cab_misc_pdf/naaqs_sep_2010. Accessed on January 21, 2011.

In addition to the regulations associated with criteria pollutants, regulations pertaining to greenhouse gases (GHGs) are being evaluated by federal and state governments. At the time of this analysis, no federal or state standards for GHGs were in existence. In Hawaii, the Global Warming Solutions Act of 2007, intended to reduce statewide GHG emissions to 1990 levels by 2020, mandates procedures to define GHG emissions in Hawaii and to develop measures that would significantly reduce these emissions. Because GHG effects are global and not just local or regional, GHGs are discussed further under cumulative impacts, Section 5.3.

Climate and Meteorological Conditions

The climate of Hawaii is influenced by its tropical location, topography, and the surrounding Pacific Ocean. The tropical location, situated between the Pacific Anticyclone (high pressure) to the northeast and a region of lower pressure to the southwest, results in the characteristic persistent trade winds of the region. These trade winds are the most important factor contributing to the dispersion of air emissions in the state and are therefore briefly discussed.

The movement of the Pacific Anticyclone with the seasonal position of the sun causes trade wind conditions to vary over Hawaii's two seasons (summer and winter). In the summer, May through September, the Pacific Anticyclone is strongest and in a northerly position relative to Hawaii. This results in the presence of trade winds 80 to 95 percent of the time. In the winter, October through April, the Pacific Anticyclone is in a relatively southerly position which results in a decreased frequency of the trade winds at about 50 to 80 percent, based on average monthly values.[7] Based on National Weather Service Historical Records, 1945–1965, the predominant wind direction at MCB Hawaii Kaneohe Bay was from the east-northeast, approximately 35 percent of the time, and winds from the northeast quadrant occurred more than 70 percent of the time. Records from Kaneohe Bay MCAS during the years from 1992 through 2002 also indicate that the prevailing wind direction was from the east-northeast.[8] The average annual wind speed, recorded during the years from 1996 through 2006, was 8.8 miles per hour.[9]

Air Emissions

Within the state of Hawaii, the largest sources of air emissions are from power generating facilities that serve island-wide grids. None are located near enough to MCB Hawaii Kaneohe Bay to affect air quality. For example, on the island of Oahu, power generating facilities and the state's major industrial area, Campbell Industrial Park, are located on the leeward side of the island, downwind (and separated by the high Koolau Mountains) of MCB Hawaii Kaneohe Bay during prevailing trade wind conditions. Other than naturally occurring volcanic smog (vog) and fireworks on the first of the year (the latter should diminish due to the recent ban by the City), air emissions and quality within the state have not raised substantive concerns because of the type of emissions present and the dispersive nature of the atmospheric environment.

Existing air emissions at MCB Hawaii Kaneohe Bay consist primarily of those resulting from the combustion of fuel by aircraft engines, vehicular engines, boilers, and generators. A source of air emissions that causes occasional nuisances due to its odors is the Kailua Wastewater Treatment Plant, approximately 0.25 miles (mi) (0.4 km) east of the base's main gate.

3.4.3 ENVIRONMENTAL CONSEQUENCES

Factors considered in determining whether an alternative would have a significant impact on air quality include the extent or degree to which its implementation would result in air emissions that would cause or contribute to a violation or violations of the NAAQS. Rules or regulations controlling effect on the NAAQS for the proposed action are limited to stationary sources. Mobile sources (e.g., vehicles and aircraft) are regulated by air pollution control

7 http://www.wrcc.dri.edu/narratives/HAWAII.htm, accessed 23 March 2011.

8 http://www.wrcc.dri.edu/htmlfiles/westwinddir.html, accessed 23 March 2011.

9 http://www.wrcc.dri.edu/htmlfiles/westwind.final.html, accessed 23 March 2011.

district or in this case the state, as needed; there are no regulations affecting use of the mobile sources in the proposed action.

Construction Impacts

Short-term construction-related air quality impacts would occur with demolition, earth-moving activities, and use of construction-related equipment such as generators and vehicles. Additional emissions would be associated with the runway underpass construction proposed in Alternative B. Air emissions associated with construction are summarized in Table 3-5 and reflect combustion and fugitive dust emissions from construction and demolition equipment and activities, including but not limited to: backhoes, bulldozers, cranes, loaders, water trucks, hauling trucks, graders, rollers, asphalt spreaders, compactors, forklifts, concrete trucks, supply trucks, compressors, generators, and fugitive dust based on affected area. Supporting documentation is provided in Appendix E.

Table 3-5. Estimated Annual Air Emissions From Construction at MCB Hawaii Kaneohe Bay

Alternative	CO (tons/yr)	NOx (tons/yr)	SOx (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)
A	7.31	15.12	0.01	5.34	1.77
B	6.18	12.24	0.01	4.27	1.46

Estimated Annual Construction Emissions in Tons = (Total Construction Emissions in Tons)/(2 years)
To estimate annual emissions, construction emissions were presumed to occur over a two-year period. Since the actual duration of construction is likely to occur over a longer period of time, actual emissions are likely to be less.

Construction related emissions would not be significant under either Alternative A or B because emissions would be short-term, and existing controls and requirements would serve to minimize impacts. Such controls and requirements include:

- Implementation of traffic control plans for construction-related deliveries;
- Control of fugitive dust associated with structural demolition, earthmoving activities, and truck transport (HAR 11-60.1-33[10] prohibits the generation of visible fugitive dust without taking reasonable precautions such as the use of water for controlling fugitive dust during demolition or road grading); and

[10] HAR 11-60.1, including HAR 11-60.1-33, is made part of the State Implementation Plan used to maintain compliance with the NAAQS pursuant to the Federal Clean Air Act and Amendments.

- Compliance with operating permit conditions and Best Management Practices (BMPs), including contractor compliance with equipment under their control, e.g., portable generators and cranes.

Under the No Action Alternative, with no construction emissions, there would be no impact on air quality.

Operational Impacts

The proposed action would introduce new types of aircraft, personnel, and supporting facilities to Hawaii. Emission source types from these changes are categorized as stationary and mobile (aircraft and vehicles) sources. Operational emissions and their potential impact on air quality would be similar under Alternatives A and B. Air emissions associated with operational sources are summarized in Table 3-6. The ground/tactical support equipment category could include both stationary sources, e.g., mobile ground power units, and mobile sources, e.g., vehicles used to move cargo. Supporting documentation is provided in Appendix E.

Table 3-6. Estimated Annual Air Emissions From Non-Aircraft Operational Emissions At MCB Hawaii Kaneohe Bay (Year 2018)

Source Type	CO (tons/yr)	NOx (tons/yr)	SO2 (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)
Personal-Owned Vehicles[1]	16.84	2.15	0.01	0.15	0.15
Government-Owned Vehicles[1]	1.51	0.73	0.00	0.05	0.05
Ground/Tactical Support Equipment[2]	85.83	7.46	0.04	0.82	0.80
Totals	104.17	10.35	0.05	1.02	1.00

1 Based on population.
2 Based on aircraft.

Stationary Sources. Additional stationary source emissions needed to support the proposed action would include those from on-site standby generators and from off-site power plants. On-site standby generators associated with new structures would be tested occasionally and operated only during the infrequent occasions when base power is not available. Such emissions would not significantly impact air quality. When the details of design and associated emission sources become available, all regulated sources and their emissions will comply with the permitting requirements under the Clean Air Act and Amendments and as administered by the State of Hawaii Department of Health.

The additional electricity needed to meet the demands of the proposed action and other planned developments at MCB Hawaii Kaneohe Bay (see Section 3.12.6) would be provided by Hawaiian Electric Company's (HECO's) island-wide grid using power generated by existing power plants on the leeward side of the island. Additional emissions associated with the additional electricity needed to support these facilities (and the personnel and their families within base and off-site housing) would not significantly impact air quality, as the plants operate under air permits that require emissions controls to prevent significant impacts on air quality.

Mobile Sources (Vehicles). Unlike specific stationary sources, vehicular emissions are not regulated but are presented so that they can be evaluated at an order of magnitude level. Emissions for personal-owned vehicles, government-owned vehicles, and ground/tactical support equipment are provided in Table 3-6. These emissions err on overestimating actual emissions as they are based on activities associated with MV-22 aircraft and not the H-1 aircraft. Ground/tactical support equipment emissions, e.g., cargo loading, associated with each MV-22 are greater than those associated with the H-1 aircraft.

With the addition of approximately 1,000 military personnel, 1,100 military family members, and 22 civilian employees, the greatest impact on air quality from vehicular emissions (within or outside of MCB Hawaii Kaneohe Bay) would occur from an additional 153 vehicles (total in two directions) during the morning peak-hour period just outside the MCB Hawaii Kaneohe Bay main gate. This location has the greatest potential for air quality impacts considering (1) the potential for traffic delays, and (2) the cumulative total volume of vehicles anticipated at any one location associated with the proposed action (including vehicles directly and indirectly associated with the proposed action, e.g., intra-base movement of privately owned vehicles). Emissions from these additional vehicles and the maximum cumulative estimate of 1,220 vehicles per hour would not significantly degrade air quality because of the relatively low cumulative number of vehicles per hour and the dispersive nature of the atmospheric environment in Hawaii. Additionally, project designs and plans such as additional sentries at the main gate would improve traffic flow to further lessen any impacts on air quality. No significant impacts on air quality would occur from vehicular emissions with the action alternatives. No changes would occur under the No Action Alternative; therefore, no impacts on air quality would occur.

Mobile Sources (Aircraft). Table 3-7 summarizes the Marine Corps plans to base aircraft under the proposed action at MCBH in 2018. No regulatory requirements exist to necessitate the estimation of these mobile source emissions. However, to gauge the potential for impacts on air quality, emissions have been estimated and their aggregate totals compared to the major stationary source definition of 250 tons per year (tpy) (or more of any air pollutant) from the Clean Air Act stationary source PSD program for attainment areas.

Table 3-7. Proposed Action Changes to Marine Corps Aircraft in Hawaii

	Baseline 2009 and No Action 2018		Full Implementation 2018		
Squadron	Aircraft Type	Count	Aircraft Type	Count	Net Change
HMLA	–	0	AH-1/UH-1	15/12	27
VMM[1]	–	0	MV-22	12	12
VMM	–	0	MV-22	12	12

Notes

1 Squadron numbers will be assigned once the squadrons are activated.

Table 3-8 summarizes the emissions from two squadrons of MV-22s (24 total aircraft) and the squadron of H-1s (27 total aircraft). Based on emissions data from the Aircraft Environmental Support Office and activity operating characteristics associated with the proposed action, emissions from the proposed aircraft would be well below the 250 tpy threshold at MCAS Kaneohe Bay. Details of the emission calculations are presented in Appendix E.

No significant impacts on air quality would occur with the proposed changes in aircraft basing under the proposed action. With the emissions less than PSD thresholds, the dispersive nature of the aircraft emissions, and the dispersive nature of the atmospheric environment in the state of Hawaii, emissions are unlikely to be concentrated and significantly affect National or State AAQS.

With the No Action Alternative, no changes would occur and no impact on air quality would result.

Table 3-8. Estimated Annual Air Emissions from MV-22 and H-1 at MCAS Kaneohe Bay

Squadron/ Aircraft (total aircraft)	Activity	MCAS Emissions (tons/yr)					
		CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	ROG
VMM/MV-22 (24 aircraft)	Operations	7.04	16.56	0.80	2.80	2.80	0.12
	Maintenance and Testing	3.55	6.31	0.31	1.05	0.00	0.06
	Subtotals	10.59	22.86	1.12	3.84	2.80	0.17
HMLA/AH-1 (15 aircraft)	Operations	2.55	1.14	0.08	0.89	0.89	0.13
	Maintenance and Testing	0.57	0.12	0.01	0.11	0.11	0.03
	Subtotals	3.12	1.26	0.09	1.00	1.00	0.17
HMLA/UH-1 (12 aircraft)	Operations	1.70	0.76	0.06	0.59	0.59	0.09
	Maintenance and Testing	0.46	0.09	0.01	0.09	0.09	0.03
	Subtotals	2.16	0.85	0.06	0.68	0.68	0.11
Totals		**15.88**	**24.97**	**1.28**	**5.52**	**5.52**	**0.45**
Emissions totals greater than PSD reference of 250 tons/yr		No	No	No	No	No	Not applicable

Oxides of nitrogen (NO_x) presumed to be 100 percent converted to NO_2.
ROG – Reactive Organic Gases.

Summary

Construction-related impacts would not be significant with either Alternative A or B. Emissions would be short-term, and existing regulatory controls would minimize impacts.

During operations, increases in stationary and mobile source emissions would be similar under Alternatives A and B. Emissions from generators and other stationary sources would be controlled through the existing regulatory permit process under the Clean Air Act and Amendments that prevents significant impacts on air quality. Emissions from mobile sources would be readily dispersed. There would be no change in air quality with the No Action Alternative.

No mitigation is required for any of the action alternatives.

3.5 NOISE

3.5.1 INTRODUCTION

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Sound is all around us. Noise is defined as unwanted or annoying sound that interferes with or disrupts normal human activities. Although exposure to very high noise levels can cause hearing loss, the principal human response to noise is annoyance. The response of different individuals to similar noise events is diverse and is influenced by the type of noise, the perceived importance of the noise, its appropriateness in the setting, the time of day, the type of activity during which the noise occurs, and the sensitivity of the individual.

Aircraft are not the only sources of noise in an urban or suburban environment, where freeway and local roadway traffic, industrial, and neighborhood sources also contribute to or detract from the everyday quality of life. Nevertheless, aircraft are readily identified by their noise output and are typically given special attention. Consequently, aircraft noise often dominates analyses of environmental impacts. Additional background information on noise, including its effect on many facets of the environment, is provided in Appendix D.

This section summarizes the analysis of noise impacts associated with the proposed addition of MV-22 and AH/UH-1 aircraft operations at MCB Hawaii Kaneohe Bay. Factors used to evaluate noise impacts are discussed below. The ROI for aircraft noise is generally defined by areas around Kaneohe Bay exposed to noise levels of 55 dB DNL and higher (see discussion below for an explanation of DNL sound levels). In addition, the study assessed short-term noise impacts at the base during construction of facilities to support the new squadrons. The ROI for construction-related noise is mainly the area around the airfield, as well as other sites on the base where construction would occur.

Alternatives A and B would involve the same aviation activities and, hence, the same aviation noise impacts. Location of MV-22 facilities on different sides of the runway would not have a measurable effect on noise contours. Construction activities would be similar except that Alternative B would involve construction of a runway underpass.

Noise Descriptors

Noise and sound are expressed in logarithmic units of decibels (dB). A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB; sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 to 140 dB are felt as pain (Berglund and Lindvall 1995). The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a doubling (or halving) of the sound's loudness when there is a 10 dB change in sound level.

All sounds have a spectral content, which means their magnitude or level changes with frequency where frequency is measured in cycles per second or hertz (Hz). To mimic the ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental transportation and aircraft noise measurements are usually on an "A-weighted" scale that filters out very low and very high frequencies in order to replicate human sensitivity. It is common to add the "A" to the measurement unit in order to identify that the measurement has been made with this filtering process (dBA). In this document, the dB unit refers to A-weighted sound levels.

As used in environmental noise analyses, a metric refers to the unit that quantitatively measures the effect of noise on the environment. To quantify these effects, DoD and other federal agencies use three noise-measuring techniques, or metrics: first, a measure of the highest sound level occurring during an individual event (single event); second, a combination of the maximum level of that single event with its duration; and third, a description of the noise environment based on the cumulative effects of all noise-generating activities.

Single noise events can be described with Maximum Sound Level (Lmax) and Sound Exposure Level (SEL). The cumulative energy noise metric used for most analyses is DNL. These metrics and their uses are described below.

Maximum Sound Level (Lmax) (or maximum A-weighted sound level). Lmax is the highest A-weighted integrated sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight). During an aircraft overflight, the noise level starts at the ambient or background noise level, rises to the maximum level as the aircraft flies closest to the observer, and returns to the background level as the aircraft recedes into the distance. The maximum sound level indicates the maximum sound level occurring during the event. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, or other common activities. Although it provides some measure of the intrusiveness of the event, it does not completely describe the total event, because it does not include the period of time that the sound is heard.

Sound Exposure Level (SEL). SEL is a composite metric that represents both the intensity of a sound and its duration. Individual time-varying noise events (e.g., aircraft overflights) have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. The SEL provides a measure of the entire acoustic event, but it does not directly represent the sound level heard at any given time. During an aircraft overflight, SEL would include both the Lmax and the lower noise levels produced during onset and recess periods of the overflight. SEL is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of a constant sound that would, in one second, generate the same acoustic energy as the actual time-varying noise event. For sound from aircraft overflights, which typically lasts more than one second, the SEL is usually greater than the Lmax because an individual overflight generally takes seconds to occur and the Lmax occurs instantaneously. SEL is the best metric to compare noise levels from overflights.

Military aircraft flying at training ranges generate noise that is somewhat different from that associated with airfield operations. As opposed to the patterned or continuous noise environments associated with airfields, overflights in training areas are sporadic (varied in frequency).

Day-Night Average Sound Level (DNL). DNL are cumulative sound levels that account for the exposure of all noise events in a 24-hour period. In order to account for increased human sensitivity to noise at night, DNL includes a 10 dB penalty to nighttime events (10PM to 7AM). The penalty added to the DNL accounts for the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours. If the nighttime penalty was omitted, DNL would mathematically represent the continuous sound level that would be present if all of the variations in sound level that occur over a 24-hour period were smoothed out so as to contain the same total sound energy. This composite metric accounts for the maximum noise levels, the duration of the events (sorties, operations, etc.), and the number of events that occurs over a 24-hour period. This metric does not represent the sound level heard at any particular time, but quantifies the total sound energy received over the 24-hour period. While it is normalized as an average, it represents all of the sound energy, and is therefore a cumulative measure. DNL is commonly used in land use planning.

Noise Study Methodology and Assumptions

The noise study undertaken for this EIS was structured to be consistent with aircraft noise impact analysis requirements of the DoD's AICUZ (Air Installation Compatibility Use Zones) Program.

As noise from future activity cannot be physically measured in the present, this EIS computes and estimates the noise generated by aircraft operations and compares exposures from operational alternatives. Analyses of aircraft noise exposure and compatible land use around DoD airfields and airspace are typically accomplished using the DoD NOISEMAP suite of computer programs (Wyle 1998) with the Rotorcraft Noise Model (RNM) Version 7.2.2 (Wyle 2007a). The computations draw from a spectral database of actual aircraft noise measurements. These programs are most appropriate for comparing "before-and-after" noise impacts which would result from proposed changes or alternative actions, when the calculations are made in a consistent manner. The models allow noise predictions for such proposed actions without the actual implementation or noise monitoring for those actions.

Noise levels from flight operations exceeding ambient noise typically occur beneath main approach and departure corridors, in local air traffic patterns around the airfield, and in areas immediately adjacent to parking ramps and aircraft staging areas. As aircraft in flight gain altitude, their noise contribution drops to lower levels, often becoming indistinguishable from the ambient noise. For these reasons, the operations associated with LZ Boondocker, located in the southeast area of MCB Hawaii Kaneohe Bay, were not included in the model. Noise from aircraft using LZ Boondocker was not modeled because of the relatively infrequent use of the LZ. Likewise, aircraft noise was not modeled at other LZs which are not part of the airfield and which are used for administrative purposes (infrequently).

Noise contours from 55 to 85 dB DNL were developed using NOISEMAP for the applicable scenarios of this EIS. The model calculated the cumulative DNL at six Points of Interest (POI) in the environs of MCB Hawaii Kaneohe Bay. POIs are used in the analysis to quantify changes in noise levels at specific points, and to quantify the contributions of specific aircraft to the total aircraft noise contours. All POIs are in residential areas along the shoreline of Kaneohe Bay, except for Coconut Island, a marine biology laboratory. The six POIs are (from east to west along the Kaneohe Bay shoreline): Puu Papaa (PP) near the H-3 entrance to the base; the YWCA's Kokokahi facility (KK); Coconut Island (CI), site of the Hawaii Institute of Marine Biology; Lilipuna Road (LR) in the residential area facing Coconut Island; Kealohi Point (KP) at Heeia State Park; and Kamehameha Highway (KH) between Heeia and Kahaluu. Locations of the POIs are shown in the aircraft DNL contour maps that follow.

Representative POIs were also evaluated because aircraft noise complaints can occur at any DNL with changes in single event noise levels during aircraft flyby events, aircraft over-flight patterns, and aircraft frequencies. The relative degree of potential complaint risks between the action alternatives and the No Action Alternative were compared by examining the increase in noise levels at these locations, and by examining the extent of any additional noise sensitive properties newly encompassed by the 65 dB DNL contours.

Calendar year 2009 was considered to be the baseline timeframe, and 2018 was considered to be the future or forecast year at MCB Hawaii Kaneohe Bay**.** Modeling was initially based on an interim 2008 noise study (Wyle 2008) which in turn was based on an earlier AICUZ study (NAVFAC PAC 2006). Assumptions and modeling parameters regarding baseline operations at the installation were obtained primarily from MCAS personnel, and interviews were conducted to update and verify operational assumptions.

The baseline condition for MCB Hawaii Kaneohe Bay considered approximately 53,000 total flight operations (see Table 3-1 and Appendix D). Nearly 40 percent of the total flight operations are from based P-3 Orion aircraft. Approximately one-quarter of the total flight operations are from based CH-53 Sea Stallion helicopters and transient helicopters. Transient fighter/attack jet aircraft comprise approximately 500 annual flight operations and are represented by legacy F/A-18C/D Hornet aircraft. Annual operations totaling 42 for transient medium jet aircraft (e.g., Boeing B-757) and 4th Force Reconnaissance (Unmanned Aerial System) aircraft were not modeled due to their insignificant contribution to the overall aircraft noise environment. Four percent of the total flight operations are during the DNL nighttime (10PM to 7AM) period.

The aircraft flight tracks used to model baseline and future year operations at MCB Hawaii Kaneohe Bay are shown in Appendix D. Typically, fixed-wing aircraft remain offshore or over Kaneohe Bay and do not fly inland to the south or west of the base. Rotary-wing aircraft may fly inland, to and from the south, and cross the shoreline in the vicinity of Malae Point.

Noise Exposure

Figure 3-3 shows the 55 to 85 dB aircraft DNL contours, in 5 dB increments, for the baseline condition. This figure shows the location of the POIs referenced above, as well as the location of public schools in the vicinity. The path of the departure and arrival routes are evident in the shape of the location of the 55, 60, and 65 dB DNL contours, paralleling the coastline of

Kaneohe Bay near Kealohi Point. The 55 dB DNL contour extending toward Kokokahi is primarily due to jet takeoff roll departing to the northeast on Runway 04. The only off-base landfall of the 65 dB DNL contour is the northern portion of Coconut Island in the middle of Kaneohe Bay.

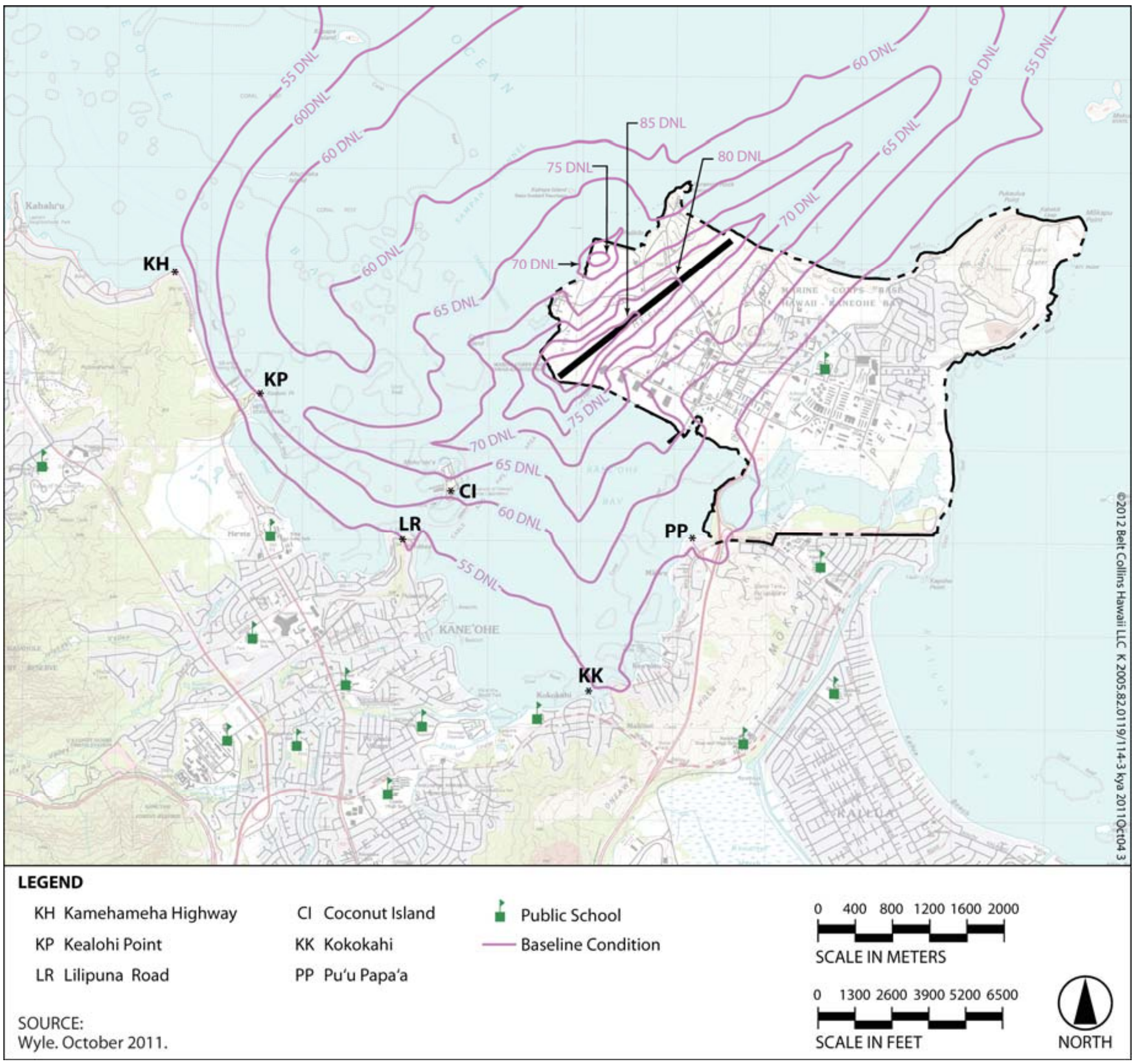


Figure 3-3. Aircraft DNL Contours at MCB Hawaii Kaneohe Bay for 2009 Baseline Condition

Table 3-9 lists the DNL for the baseline condition for each of the six POIs. Areas exposed to 65 dB DNL or greater primarily include the water areas, MCB Hawaii Kaneohe Bay, and the northern portion of Coconut Island. From the DNL contours and this data, it was concluded that, except for CI, baseline aircraft noise levels do not exceed the AICUZ land use compatibility criteria of 65 dB DNL in the communities along the shoreline of Kaneohe Bay.

Table 3-9. Estimated Aircraft DNL for Representative POIs Baseline Condition (2009) at MCB Hawaii Kaneohe Bay

Point of Interest (POI)	Baseline DNL (dB)
Kamehameha Highway (KH)	22
Kealohi Point (KP)	660
Coconut Island (CI)[1]	61
Lilipuna Road (LR)	57
Kokokahi (KK)	55
Puu Papaa (PP)	56

1 The Hawaii Institute of Marine Biology is located on Coconut Island. The listed dB level is only for the specific point shown on Figure 3-3.

The dominant contributors to the aircraft DNL are the transient large heavy jet aircraft (e.g., C-5/An-124, C-17) and transient F/A-18 aircraft. In the vicinity of Puu Papaa (PP in Figure 3-3), helicopter operations contribute nearly the same to the overall DNL as fixed-wing operations.

3.5.2 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

Unavoidable but temporary noise impacts may occur during construction at the base, but they are not expected to be severe due to the location of the construction areas within the base's boundaries. Construction activities would be phased over a period of approximately six to ten years, and may be occasionally audible at surrounding properties. For this reason, the use of quiet equipment and construction curfew periods would be implemented to minimize construction noise impacts.

With No Action, there would be no construction of facilities to support the VMM and HMLA squadrons and no construction-related impacts. No mitigation would be required.

Operational Impacts

Table 3-2 and Appendix D provide the annual flight operations totaling nearly 79,000 under Alternatives A or B. Relative to the No Action Alternative, these action alternatives assume that two squadrons of MV-22 aircraft and one squadron of AH/UH-1 aircraft would be added to the aircraft mix at MCB Hawaii Kaneohe Bay. Three squadrons of CH-53D aircraft would be eliminated from the future aircraft mix, and one squadron of CH-53E[11] aircraft would remain at MCB Hawaii Kaneohe Bay.

Nearly 30 percent of the total flight operations[12] would be from based P-8 aircraft. Approximately 11 percent of the total flight operations would be from based CH-53 helicopters and transient helicopters. Approximately 28 percent of the total flight operations would be from based MV-22 and AH/UH-1 aircraft. Transient fighter/attack jet aircraft would comprise approximately 500 annual flight operations and would be represented by legacy Hornet aircraft. Annual operations totaling 42 for transient medium jet aircraft (e.g., Boeing B-757) and 4th Force Reconnaissance (Unmanned Aerial System) aircraft were not modeled due to their insignificant contribution to the overall aircraft noise environment. Two percent of the total flight operations would be during the DNL nighttime (10PM to 7AM) period.

MV-22 aircraft flight tracks would be similar to those of the P-3C aircraft during local (touch and go) operations, and AH/UH-1 flight tracks would be similar to those of other helicopters during local operations. The MV-22 was also assumed to use the helicopter flight tracks during its local operations at Pads 7 and 8 (located just northwest of the runway) and at the West Field Pad. Appendix D contains maps of the flight tracks for modeled baseline and future year operations at MCB Hawaii Kaneohe Bay.

Figure 3-4 depicts the forecasted 55 to 85 dB aircraft DNL contours, in 5 dB increments, for 2018 aircraft operations under the proposed action. DNL contours would remain similar in size and shape to the No Action Alternative contours, with increases in aircraft noise levels of less than 1 dB DNL. The only off-base landfalls of the 65 dB DNL contour are the northern portion of Coconut Island in the middle of Kaneohe Bay and the tip of Kealohi Point (KP). As shown, public schools would remain outside the 55 dB DNL contour. Fixed-wing aircraft would continue to be the dominant contributor to the overall aircraft noise environment.

[11] The CH-53D aircraft are to be replaced with CH-53E aircraft.

[12] An aircraft flight operation refers to any takeoff or landing at MCAS Kaneohe Bay. The takeoff or landing may be part of a training maneuver or pattern, such as touch-and-go, or associated with a departure or arrival of aircraft. A takeoff or landing counts as one operation. A pattern usually consists of two operations.

Table 3-10 summarizes estimated aircraft DNL for the six POIs under the action alternatives. Areas exposed to 65 dB DNL or greater would primarily include water and MCB Hawaii Kaneohe Bay. From the DNL contours and this data, it was concluded that aircraft noise levels would not exceed the AICUZ land use compatibility criteria of 65 dB DNL in the communities along the shoreline of Kaneohe Bay. The changes in DNL at POIs KK and PP would be approximately 1 dB DNL relative to the No Action Alternative.

Identical to the baseline condition, the dominant contributors to the aircraft DNL for the action alternatives would be the transient large heavy jet aircraft (e.g., C-5/An-124, C-17) and transient F/A-18 aircraft. In the vicinity of Puu Papaa (PP in Figure 3-3), helicopter operations would continue to contribute nearly the same to the overall DNL as fixed-wing operations.

Table 3-10. Comparison of Aircraft DNL for Representative Points of Interest (POI) for Baseline Condition (2009), No Action (2018), and Proposed Action (2018) at MCB Hawaii Kaneohe Bay

Point of Interest (POI)	Baseline DNL (dB)	No Action Alternative		Alternatives A and B		
		DNL (dB)	Change from Baseline DNL (dB)	DNL (dB)	Change from No Action DNL (dB)	Change From Baseline DNL (dB)
Kamehameha Highway (KH)	52	54	+2	54	0	+2
Kealohi Point (KP)	60	63	+3	63	0	+3
Coconut Island[1] (CI)	61	62	+1	62	0	+1
Lilipuna Road (LR)	57	58	+1	58	0	+1
Kokokahi (KK)	55	55	0	56	+1	+1
Puu Papaa (PP)	56	57	+1	58	+1	+1

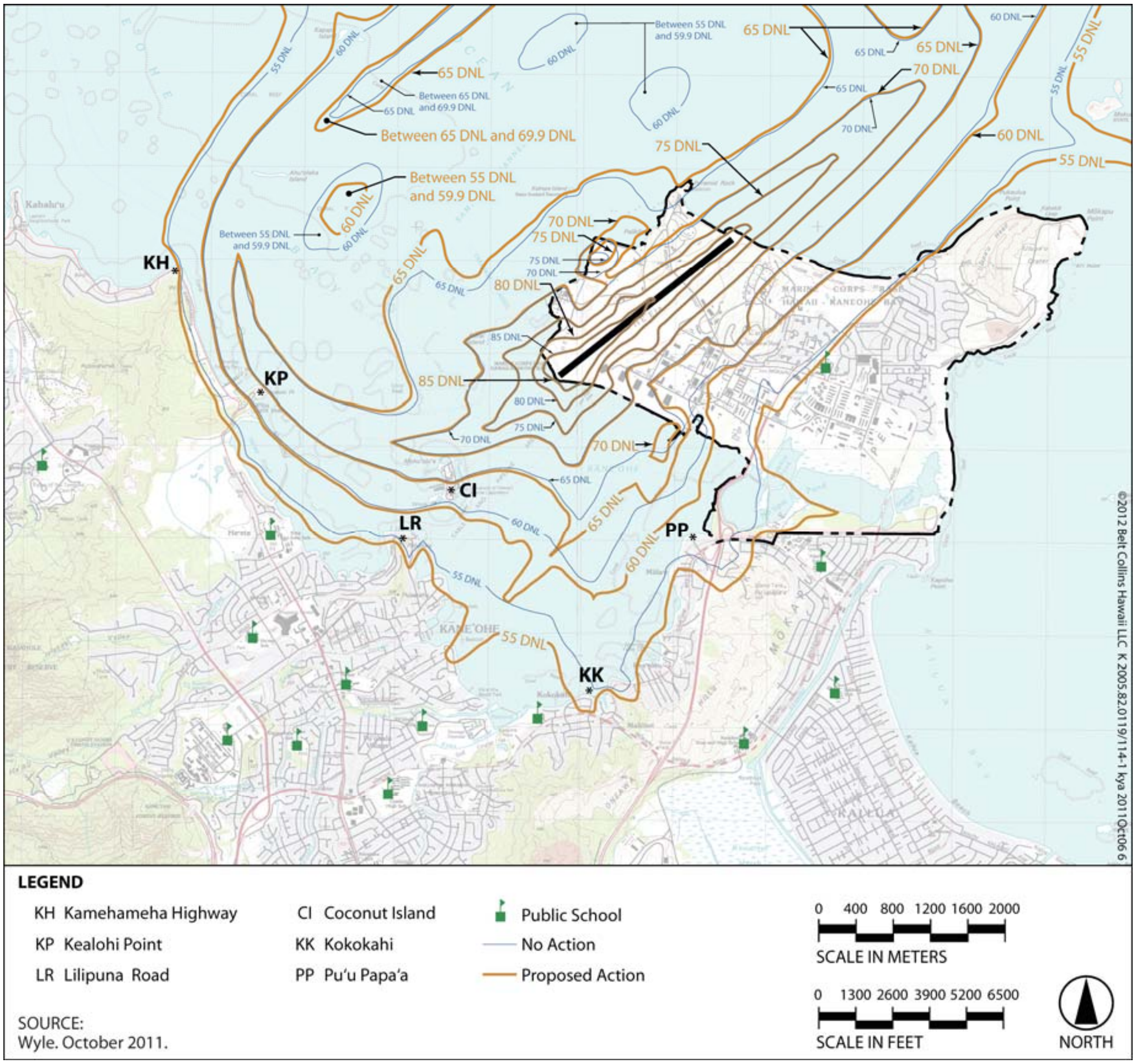


Figure 3-4. Aircraft DNL Contours at MCB Hawaii Kaneohe Bay for 2018 Proposed Action and No Action Alternative

1 The Hawaii Institute of Marine Biology is located on Coconut Island.

Figure 3-5 shows the SEL and Lmax of the primary aircraft modeled at MCB Hawaii Kaneohe Bay as they pass by the vicinity of KP. KP was chosen because it is the POI closest to the modeled flight tracks and would have the greatest DNL of the six POIs. Of the aircraft shown in Figure 3-5, the (transient) fighter/attack aircraft (represented by the F/A-18) and the large cargo/transport aircraft (represented by the C-5) would have the highest single event sound levels of approximately 109 dB SEL and 104 dB Lmax. The highest contributing types of flight operations would be touch-and-go and arrivals for the F/A-18 and C-5, respectively. In contrast, the MV-22 and H-1 aircraft single-event sound levels would be approximately 17-28 dB less than the fighter/attack and large cargo/transport aircraft with SEL and Lmax of 92 dB and 81 dB, respectively. Although the Lmax of the P-8 Poseidon (jet) aircraft would be approximately 5 dB greater than the MV-22/H-1 Lmax, the P-8 SEL would be approximately 2 dB less than the MV-22/H-1 SEL due, in part, to its faster airspeed.

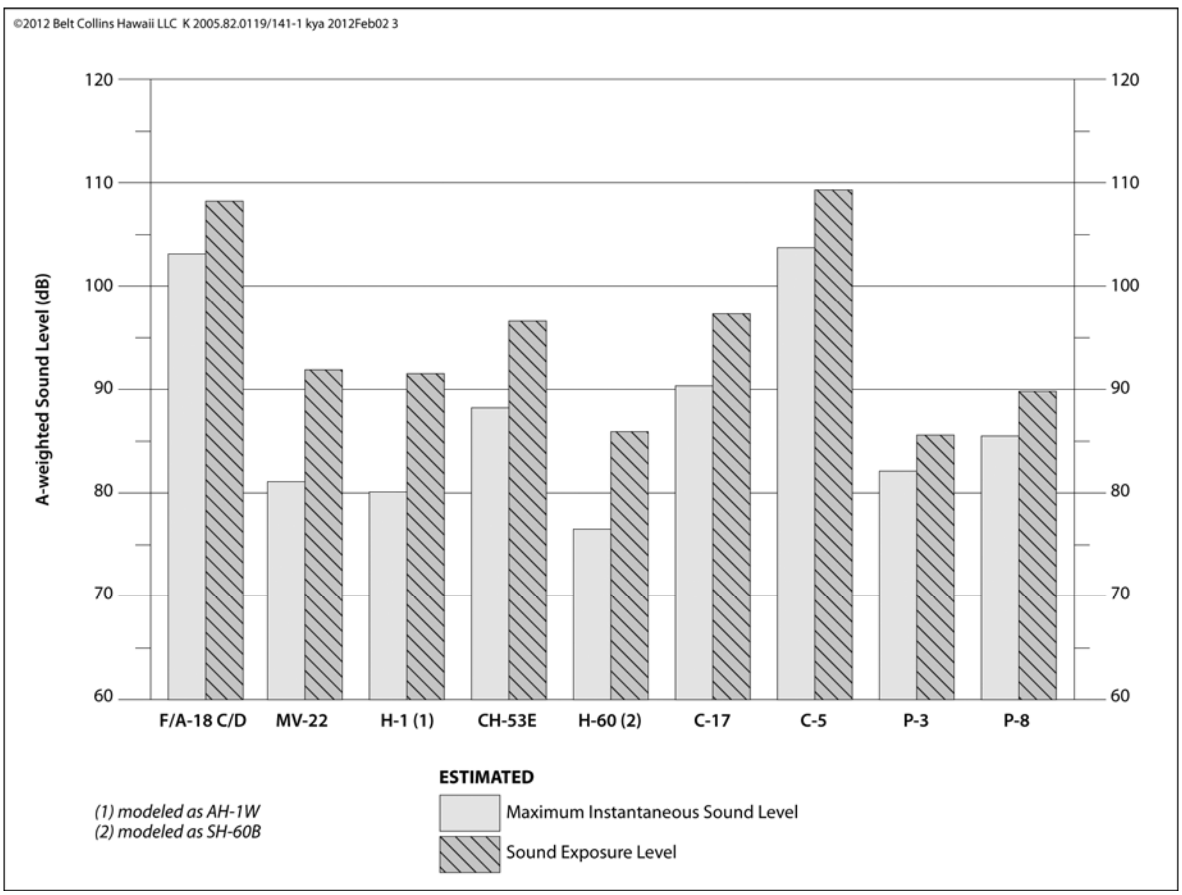


Figure 3-5. Aircraft Operating at MCB Hawaii Kaneohe Bay in the Vicinity of Kealohi Point

Table 3-3 and Appendix D provide the annual flight operations totaling nearly 61,000 under the No Action Alternative. The No Action Alternative assumes the replacement of most of the P-3C aircraft with P-8A aircraft, the transition of CH-53D to CH-53E aircraft, and the continuation of C-17, SH-60, transient medium jet, 4th Force Reconnaissance, and fighter/attack aircraft operations at levels similar to baseline. The number of based/transient small jet (i.e., C-20), transient large jet (i.e., C-5/An-124), and transient propeller aircraft operations are predicted to increase in the future. The transient propeller aircraft would increase due to the addition of a transient squadron of KC-130 tanker aircraft.

Nearly 40 percent of the total flight operations would be from based P-8 aircraft. Approximately 20 percent of the total flight operations would be based CH-53 helicopters and transient helicopters. Transient fighter/attack jet aircraft would comprise approximately 500 annual flight operations and would be represented by legacy F/A-18 aircraft. Annual operations totaling 42 for transient medium jet aircraft (e.g., Boeing B-757) and 4th Force Reconnaissance (Unmanned Aerial System) aircraft were not modeled due to their insignificant contribution to the overall aircraft noise environment. Two percent of the total flight operations would be during the DNL nighttime (10PM to 7AM) period.

Flight tracks and the distribution of aircraft among the flight tracks to the DNL time periods would not be substantially different from the baseline condition.

Figure 3-4 also shows the forecasted 55 to 85 dB aircraft DNL contours, in 5 dB increments, for the No Action Alternative. The DNL contours as shown in Figure 3-4 would be slightly larger than the No Action Alternative, with increases in aircraft noise levels of less than 3 dB DNL. The only off-base landfall of the 65 dB DNL contour are the northern portion of Coconut Island in the middle of Kaneohe Bay. Public schools in the vicinity would remain outside the 55 dB DNL contour. Fixed-wing aircraft would continue to be the dominant contributor to the overall aircraft noise environment.

Table 3-10 summarizes estimated aircraft DNL for the six POIs under the No Action Alternative. Areas exposed to 65 dB DNL or greater primarily include water and MCB Hawaii Kaneohe Bay. None of the representative POIs would be exposed to DNL of 65 dB or greater. Increase in DNL relative to the baseline condition would range from nearly 0 dB DNL (at KK) to approximately 3 dB (at KP). This increase would be primarily due to the approximate 200 percent increase in transient large heavy jet aircraft (e.g., C-5/An-124, C-17) operations, which are not part of the proposed action. From the DNL contours and this data, it was concluded that the No Action Alternative aircraft noise levels would not exceed the AICUZ land use compatibility criteria of 65 dB DNL in the communities along the shoreline of Kaneohe Bay.

Identical to the baseline condition, the dominant contributors to the aircraft DNL for the No Action Alternative would be the transient large heavy jet aircraft and transient F/A-18 aircraft. In the vicinity of Puu Papaa (PP in Figure 3-3), helicopter operations would continue to contribute nearly the same to the overall DNL as fixed-wing operations.

Summary

During construction, temporary noise would be managed by State DOH permit requirements.

Aircraft operations would be the dominant noise contributor during operations. Projected changes in aircraft noise at the POIs under the action alternatives would range from 1 to 3 dB DNL compared to baseline, and from 0 to 1 dB DNL compared to the No Action Alternative. Areas exposed to 65 dB DNL or greater would primarily include water and MCB Hawaii Kaneohe Bay. Only the northern portion of Coconut Island and the tip of Kealohi Point would be encompassed by the 65 dB DNL. Fixed wing aircraft would continue to be the primary contributors to noise in the environs.

3.6 GEOLOGY, SOILS, AND TOPOGRAPHY

3.6.1 INTRODUCTION

This section describes the general geology, soils, topography, and seismicity at MCB Hawaii Kaneohe Bay. Potential impacts would be minimized by compliance with applicable regulations and building codes, including the National Pollutant Discharge Elimination System (NPDES) permit program, International Building Code (IBC), and DoD Unified Facilities Criteria (UFC).

The ROI includes the development footprint and, with regard to erosion, receiving waters. (See also Section 3.7.) With different development footprints and concepts, Alternatives A and B would have different potential impacts. Under Alternative B, construction of the underpass would require substantial excavation work and ground water dewatering efforts.

3.6.2 AFFECTED ENVIRONMENT

Geology and Soils

Mokapu Peninsula was formed by basaltic lava eruptions from four separate volcanic vents during the last period of volcanic activity on Oahu. Major volcanic features of the peninsula include Kuau or Pyramid Rock on the northwestern tip of the installation, Puu Hawaii Loa in the central area, and Ulupau Crater on the northeastern tip. Following this volcanic activity, the peninsula was inundated by a rise in the sea level, during which time an extensive coral reef was formed. As sea level retreated to its present level, beaches and sand dunes were formed from the deposition of calcareous sand by the prevailing tradewinds. Approximately 280 acres (ac) (113 hectares [ha]) of coral fill were added to the peninsula's marshy central drainage basin between 1939 and 1941 to both deepen the sea channel for marine vessels and create a runway (NAVFAC HI 2006).

Based on the U.S. Department of Agriculture Soil Natural Resources Conservation Service (USDA NRCS) web soil survey, the surface soil identified at the Mokapu Peninsula consists primarily of Fill Land (FL). Soil types, including Mamala Stony Silty Clay Loam (MnC), Ewa Silty Clay Loam (EmB), and Molokai Silty Clay Loam (MuC), have also been mapped in the eastern and northeastern portions of the peninsula. The NRCS defines fill land as areas filled with material dredged from the ocean or hauled from nearby areas. The silty clay loams consist of well-drained soils with moderate permeability characteristics. Runoff varies from very slow to medium, erosion hazard varies from slight to moderate, and the shrink-swell potential ranges from low to moderate. Shallow borings performed for runway and taxiway projects in the 1950s and 1960s indicated that the surface soils in these areas consisted of fill material.

Additional information on existing surface and subsurface soils would be determined with site-specific geotechnical engineering investigations.

Topography

The three volcanic highpoints at MCB Hawaii Kaneohe Bay, Pyramid Rock, Puu Hawaii Loa, and Ulupau Crater, are at elevations of approximately 40 ft (12 m), 200 ft (61 m), and 600 ft (183 m) above mean sea level, respectively (NAVFAC HI 2006). Topography at MCB Hawaii Kaneohe Bay generally slopes away from the high points and toward Nuupia Ponds, with coastal areas sloping toward the shores. The existing terrain in the vicinity of Alternatives A and B is relatively level with ground elevations ranging from approximately three to 20 ft (0.9 to 6 m).[13]

3.6.3 ENVIRONMENTAL CONSEQUENCES

Geology and Soils

Soils at MCB Hawaii may be susceptible to ground settlement. As noted above, the soils also have a slight to moderate erosion hazard potential and low to moderate shrink-swell potential. For Alternatives A and B, construction activities would be completed in compliance with the geotechnical engineering recommendations incorporated into the project design,

[13] Map of Marine Corps Base Hawaii Kaneohe Bay, Oahu, Hawaii (Base Map), dated January 20, 2011.

including provisions to address settlement and soil shrink-swell potential. Site grading and construction would result in temporary soil disturbance. However, the relatively level topography would minimize erosion potential during construction. The No Action Alternative would involve no construction and, hence, no soils impacts.

Under Alternative B, construction of a runway underpass would require over excavation and installation of earth retaining and lateral support systems, dewatering, and subgrade preparation. A detailed site specific geotechnical exploration would be required for design of the underpass. It is estimated that excavation and removal of 140,000 cubic yards (CY) of material would be needed for construction of the underpass.

Construction activities under Alternatives A and B would be completed in compliance with a project-specific NPDES permit program. As part of the permit program, best management practices (BMPs) would be implemented for erosion and sediment control prior to and during construction (see Section 2.4 for details). Excessive ground settlement, erosion, and expansive soil impacts are not anticipated with the implementation of applicable geotechnical engineering practices during design and construction.

No geology or soils impacts would be associated with the No Action Alternative.

Topography

New construction associated with Alternative A would require minimal grading work as the project site is relatively level and is currently developed. Under Alternative B, construction of the underpass would require substantial excavation work and ground water dewatering efforts. However, changes to the existing topography would be minimal. Grading and construction work for Alternatives A and B would be completed in accordance with applicable UFC documents and other government requirements. Site-specific geotechnical engineering reports would also be required. As a result, topographic impacts are not anticipated as a result of either Alternative A or B. With no construction proposed, the No Action Alternative would have no impacts related to topography.

Summary

Potential development-related impacts on geology, soils, and topography would vary with Alternatives A and B. With the No Action Alternative, there would be no construction-related impacts.

Under Alternative B, the construction of the underpass would require substantial excavation work and dewatering efforts. For Alternatives A and B, potential impacts would be minimized because the Marine Corps would comply with applicable regulations and building codes, conduct site specific geotechnical investigations, and incorporate BMPs prior to, during, and after construction. No mitigation is required. With the No Action Alternative, no impacts related to geology, soils, or topography would occur.

3.7 DRAINAGE, HYDROLOGY, AND WATER QUALITY

3.7.1 INTRODUCTION

This section describes drainage and water quality at MCB Hawaii Kaneohe Bay as these resources/issues apply to the proposed action. Potential impacts are determined by compliance with regulations applicable to storm water discharge such as the NPDES permit program, water quality standards, and applicable DoD requirements. The ROI is the portion of the base proposed for development and additional aviation activities, as well as receiving waters.

The issue of groundwater resources does not require detailed analysis. According to the current Marine Corps Base Hawaii Master Plan (NAVFAC HI 2006), there are no potable water wells on the base. No potable groundwater aquifer occurs on the base. What does occur is a brackish basal lens (Mink and Lau 1990a; Stearns and Vaksvik 1935; USGS 1968). Regarding surface water resources, there are no impaired water bodies[14] in the vicinity.

Changes in drainage conditions would vary slightly between the two action alternatives since VMM squadron improvements would add impervious surfaces in different locations on the base. Hydrology and water quality conditions during both construction and operations would be the same for the two action alternatives.

3.7.2 AFFECTED ENVIRONMENT

MCB Hawaii Kaneohe Bay is a peninsula bordered by Kaneohe Bay to the south and west, the ocean along the north and west, and Nuupia Ponds along the south side at the east end. Much of the base development is along the south side, characterized by relatively flat and low lying areas draining to the west and south.

Surface waters surrounding the peninsula are classified and regulated by the State of Hawaii under *Title 11 Hawaii Administrative Rules, Department of Health, Chapter 54 Water Quality Standards.* The waters of Kailua Bay and outer portions of Kaneohe Bay are designated Class

[14] As listed under Clean Water Act Section 303(d)

A marine waters, protected for recreational purposes and aesthetic enjoyment. The inner portions of Kaneohe Bay are designated as Class AA marine waters, designated to remain in a natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or action (OEP 1987c).

New facilities and renovation of existing facilities in support of the proposed action would occur in the western part of the base, west of "G" Street and the H3 main gate which runs north-south at the middle of the base. (For a map showing street locations on the base, see Figure 3-16 in the roadways and traffic section.) Puu Hawaii Loa with a peak of 200 ft (61 m) and higher ground at the northwest corner of the base border the north edge of the subject drainage area. The area is generally developed with the runway and aviation facilities dominating the western area and a portion of the south edge along Kaneohe Bay. Box culverts drain the runway area southward to the bay. Other box drains discharge runoff for the area west of the runway to the ocean toward the west. The base main cantonment area east of the runway is drained by a series of pipe drain systems to Kailua Bay or overland.

A narrow center portion of the base covering an area east of "G" Street to Craig Avenue is drained by a drainage channel discharging southward into Kaneohe Bay. The east side of the main base developed area drains mainly southward via pipe systems and a channel into Nuupia Ponds.

3.7.3 ENVIRONMENTAL CONSEQUENCES

Alternatives A and B would provide new and expanded aircraft parking aprons, hangars, warehouses, administrative type spaces, and housing (see Chapter 2). The facilities would be dispersed in the area bordered by the runway at the northwest, Mokapu Road at the northeast, G Street on the east, and Kaneohe Bay along the southwest. New pavements and buildings constructed in non-paved areas would generally increase storm surface runoff. New aircraft parking aprons and hangars for the MV-22 aircraft would have approximately 26.2 ac (10.6 ha) of impervious surface, with about three-quarters of the facilities to be sited in areas vegetated by non-native koa haole (*Leucaena leucocephala*) shrubs. Other facilities would be mainly renovation of existing aircraft parking aprons and hangars, as well as new buildings and pavements in existing impervious surfaced areas. Storm water runoff from these project sites would generally be to Kaneohe Bay along the southwest side of the base.

The Naval Facilities Engineering and Construction Bulletin (NAVFAC 2007) requires that new facilities be designed to Leadership in Energy and Environmental Design (LEED)[15] silver performance rating. Construction under Alternative A or B would be implemented under Section 438 of the Energy Independence and Security Act (EISA) and UFC 3-210-10, Low Impact Development (LID), which call for projects to maintain storm water discharge to pre-development hydrology conditions to the maximum extent technically feasible, and for application of BMPs for water quality (UFC 2010).

Project design provisions to accomplish the above could include surface and subsurface retention facilities, enhanced infiltration by use of vegetated channels and swales, as well as bio-retention areas and/or water quality units.

Projects would be carried out in compliance with NPDES permit requirements. In addition, storm water during operations would be managed with LID practices implemented as practicable to control or otherwise reduce runoff before entering piped and lined channels for off-site discharge. Conditions at MCBH Kaneohe Bay related to technical constraints that limit meeting the UFC objective may include contaminated soils, high ground water levels, small sites that limit infiltration of runoff into the ground, and limited non-potable water reuse opportunities.

Summary

Net impacts to Kaneohe Bay and Nuupia Ponds associated with Alternatives A and B would be minimal due to the following:

- Much of the construction supporting the proposed action would involve renovation and replacement of facilities, with new facilities being constructed mainly in already developed areas.
- Impervious areas added to the existing developed area of the base for construction of new aviation facilities are estimated at 20 ac (8 ha). The 20 ac (8 ha) represent approximately three-quarters of the land to be occupied by new facilities in existing vegetated areas to be cleared for construction. The additional impervious area is 2.3 percent of the 850-plus ac (344 ha) of the developed part of the base that presently contribute to discharges into Kaneohe Bay to the south.
- Design standards and BMPs would be applied to control surface storm water runoff, as well as to improve or maintain the quality of discharged waters.

[15] The LEED program is administered by the U.S. Green Building Council.

With the implementation of BMPs and LID measures for control of storm runoff included in project design, no additional mitigation is required for Alternative A or B. No drainage or water quality impacts would be associated with the No Action Alternative.

3.8 BIOLOGICAL RESOURCES

3.8.1 INTRODUCTION

This section addresses biological resources at MCB Hawaii Kaneohe Bay. The discussion is divided into the following subsections:

- Terrestrial and Marine Flora, with a focus on threatened and endangered species listed under the Endangered Species Act of 1973 (ESA), as amended;
- Terrestrial and Marine Fauna, with a focus on ESA-listed and Marine Mammal Protection Act species and birds protected under the Migratory Bird Species Act (MBTA) of 1918, as amended;
- Invasive Species (plant and animal, terrestrial and aquatic);
- Habitat (Critical Habitat, Jurisdictional Wetlands, and Coral Reefs); and
- Existing Management Measures. Bird Aircraft Strike Hazard (BASH) and wildland fire risks both involve biological resources and safety concerns and, therefore, are presented in this section as well as in Section 3.10.

The ROI for biological resources encompasses the areas proposed for development under Alternatives A and B and those areas of the base where proposed construction or aviation activities could directly or indirectly impact protected species. Adjacent land and water that provide habitat for these species are also included in the ROI.

Development-related impacts on biological resources may vary between the two action alternatives for one project, the proposed VMM squadron facilities. These facilities would have different footprints under Alternatives A and B. Because aviation operations would be the same for Alternatives A and B, operational impacts on biological resources would be the same for the two action alternatives. It is noted that aircraft would take off from and land on airfield, helipad, or landing zone pavement with adequate buffer areas to avoid effects of MV-22 downwash on natural resources.[16]

[16] The area potentially affected by downwash associated with MV-22 aircraft is defined by a 350-foot (107-meter) radius from the aircraft's landing point. See Appendix F-2 for a memorandum addressing downwash from the rotor of an MV-22 in hover.

3.8.2 AFFECTED ENVIRONMENT

Terrestrial and Marine Flora

Much of the vegetation at MCB Hawaii Kaneohe Bay is dominated by invasive species, except along certain coastline and dune areas, which harbor a largely native community of sea strand vegetation (Drigot, Wilcox, and Duin 2001; UFWS 2008). The existing non-native vegetation cover in much of the occupied land and open space consists of planted landscape material (typically Bermuda grass and a variety of native and non-native planted trees and shrubs). The non-managed dry land vegetated areas are dominated by non-native koa haole (*Leucaena leucocephala*) shrubland. Until 2008, there were no known natural occurrences of plants listed or pending listing as threatened or endangered under the ESA as amended, on MCB Hawaii properties. In January 2008, a self-established plot of the federally listed *Sesbania tomentosa* (ohai) plant was discovered within the Nuupia Ponds Wildlife Management Area (WMA).[17] (Figure 3-6 shows the locations of the WMAs at MCB Hawaii Kaneohe Bay.)

During a U.S. Fish and Wildlife Service (USFWS)-led coastal and marine resources inventory completed for MCB Hawaii in 2008, dense native seagrass beds were found growing on soft sediment offshore from the Hale Koa recreational camping area (USFWS 2008). (See Figure 3-6 for the Hale Koa location, northeast of Sag Harbor; see Figure 3-7 for the USFWS survey transect locations.) This area has been highly modified by past dredging. Two species of seagrass occur in the dredged area but do not co-mingle. Dense patches (100% cover) of the endemic *Halophila Hawaiiana* were found at transects located approximately 1,000 ft (305 m) from shore at depths of approximately 9 to 11 ft (2.7 to 3.3 m). *Halophila decipiens* meadows (95% to 99% cover) were found growing on soft sediment at these same transects at depths greater than 13 ft (4 m). *H decipiens* was also observed at another transect in the vicinity, located at greater depths (16 to 26 ft [5 to 8 m]) where the seagrass became sparse due to less sunlight penetrating the water column.

[17] Drigot, Dr. Diane. Personal communication. 2011.

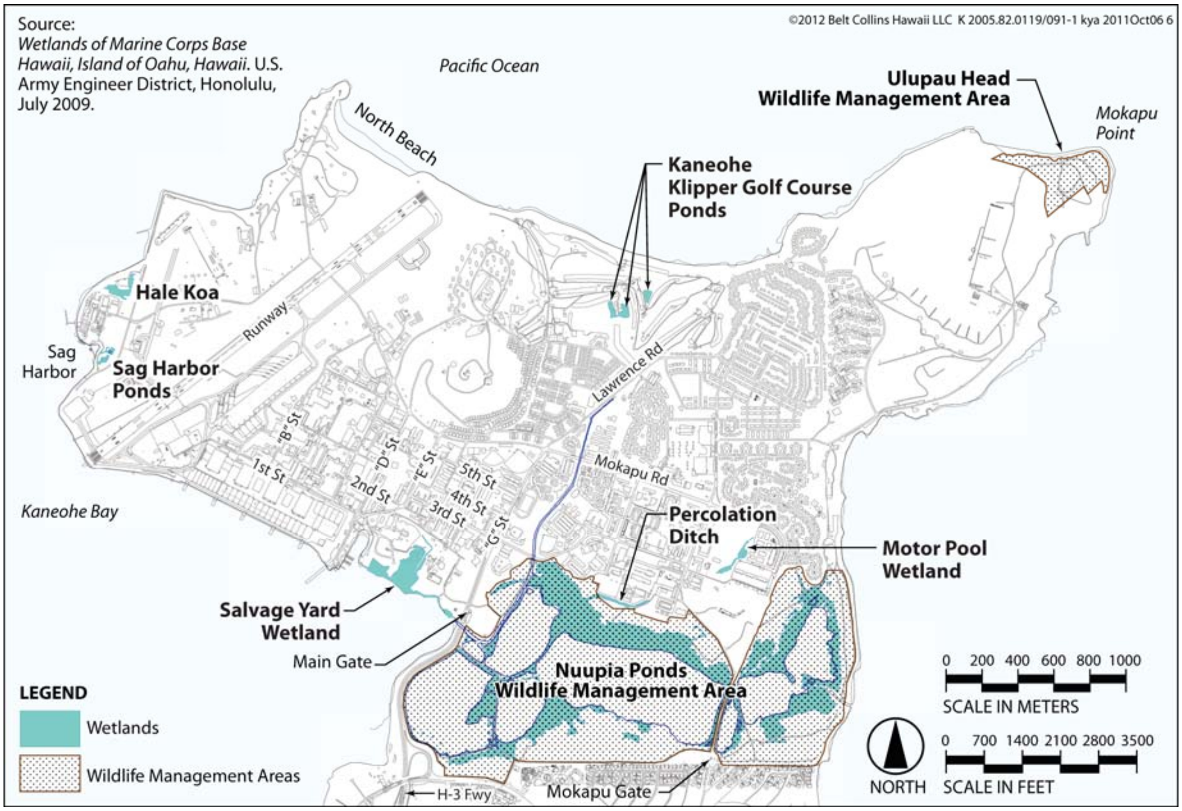
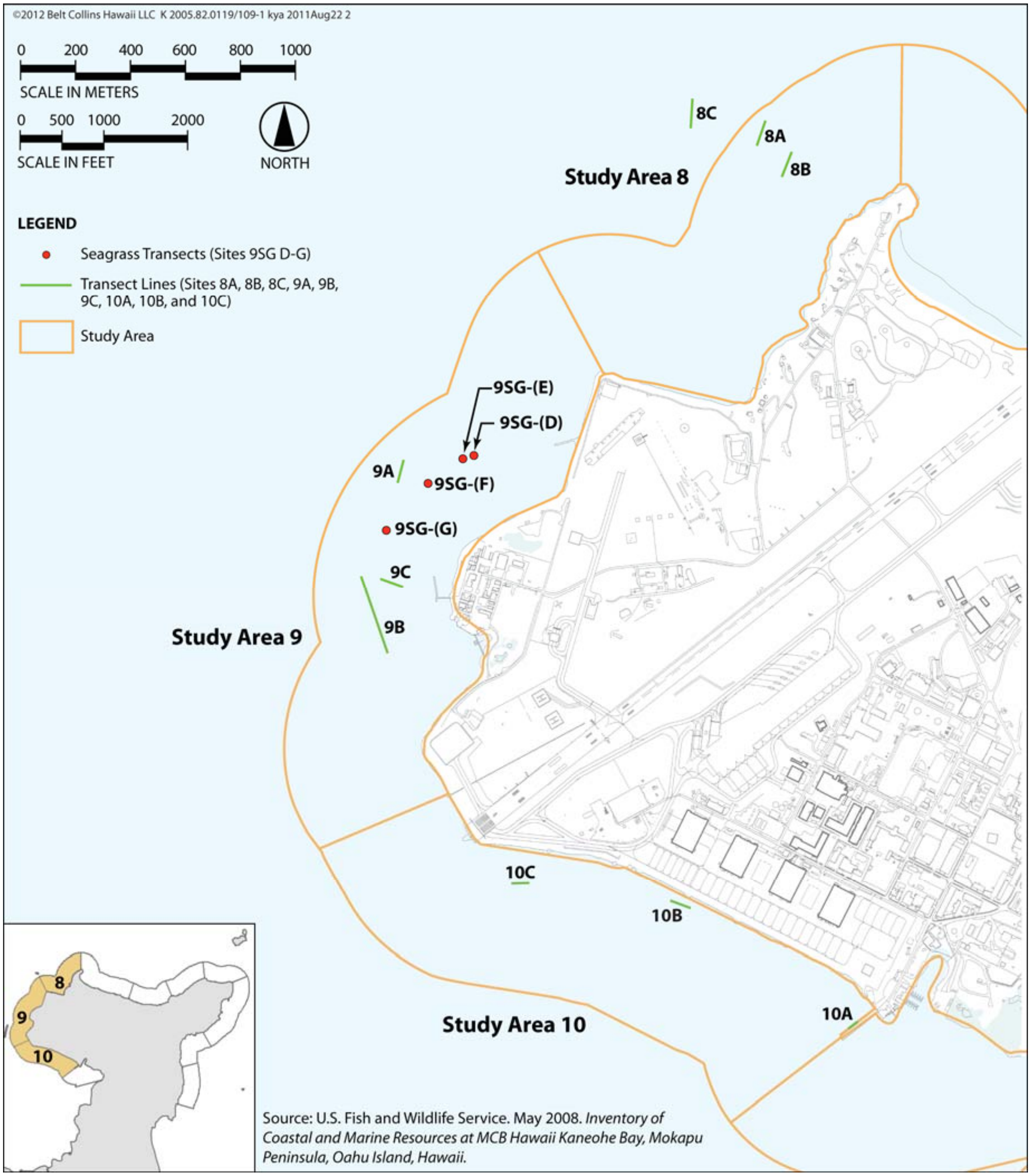


Figure 3-6. MCB Hawaii Kaneohe Bay Wetlands

1



2 **Figure 3-7. MCB Hawaii Kaneohe Bay Inventory of Marine Resources, Study Areas 8, 9, and 10**

Terrestrial and Marine Fauna

Threatened and Endangered Species. ESA-listed threatened (T) and endangered (E) terrestrial and marine fauna species observed at MCB Hawaii Kaneohe Bay and in surrounding ocean waters are presented in Table 3-11. In addition, the short-eared owl (*Asio flammeus sandwichensis*, pueo) is listed as endangered by the State of Hawaii.

Two WMAs, the 517-ac (209-ha) Nuupia Ponds and the 25-ac (10-ha) Ulupau Head (see Figure 3-6), provide habitat for ESA- and MBTA-listed waterfowl (at the Nuupia Ponds WMA), and for a MBTA-protected seabird colony (at the Ulupau Head WMA). Neither WMA is in the vicinity of Alternative A or B projects or activities.

Table 3-11. ESA-listed Threatened and Endangered Species Observed at MCB Hawaii Kaneohe Bay and Surrounding Waters in the 500-yard Offshore Security Buffer Zone

Scientific Name	Common Name	Hawaiian Name	Regulatory Status
Birds			
Anas wyvilliana	Hawaiian duck	Koloa moali	E
Fulica alai	Hawaiian coot	Alae keokeo	E
Gallinoula chloropus sandvicensis	Hawaiian gallinule, Common moorhen	Alae ula	E
Himantopus mexicanus knudseni	Hawaiian stilt	Aeo	E
Puffinus auricularis newelli	Newell's/Townsend's shearwater	Ao	T
Plants			
Sesbania tomentosa	'Ohai	Ohai	E
Marine Mammals and Turtles			
Monachus schauinslandi	Hawaiian monk seal	Ilio holo I ka uaua	E
Physeter catodon	Sperm whale		E
Megaptera novaeangliae	Humpback whale	Kohola	E
Eretmochelys imbriacata	Hawksbill sea turtle	Ea	E
Chelonia mydas	Green sea turtle	Honu	T
Lepidochelys olivacea	Olive Ridley sea turtle		T

Source: MCBH 2006a, Appendix C: Updated Species Inventory.; HQMC Conservation Section (CMC-OLFL-1). *United States Marine Corps, Natural Resources Conservation Program. 2010* (2nd Edition, 2010).

Migratory Birds. Table 3-12 lists bird species protected under the MBTA, 16 U.S.C. §§703-712 et seq., that have been observed at MCB Hawaii Kaneohe Bay (Drigot, Wilcox, and Duin 2001; and Draft 2001 INRMP update).

Table 3-12. MBTA-Listed Bird Species at MCB Hawaii Kaneohe Bay

Scientific Name	Common Name	Hawaiian Name	Origin
Waterbirds			
Anas platyrhynchos	Mallard		Introduced
Anas syvilliana	Hawaiian duck	Koloa moali	Endemic
Ardea herodios	Great blue heron		Visitor
Bubulcus ibis	Cattle egret		Introduced
Egretta caerulea	Little blue heron		Visitor
Egretta thula	Snowy egret		Visitor
Fulica alai	Hawaiian coot	Alae keokeo	Endemic
Gallinoula chloropus sandwicensis	Hawaiian gallinule, common moorhen	Alae ula	Endemic
Himantopus mexicanus knedseni	Hawaiian stilt	Ae o	Endemic
Nycticorax nycticorax hoactli	Black-crowned night heron	Aukuu	Indigenous
Seabirds			
Anous minutes melanogenys	Black noddy	Noio	Endemic
Anous stolidus pileatus	Brown noddy	Noio koha	Indigenous
Fregata minor palmerstoni	Great frigatebird	Iwa	Indigenous
Gygis alba	White tern	Manu-o-ku	Indigenous
Phaethon lepturus	White-tailed tropicbird	Koae kea	Indigenous
Phaethon rubricauda	Red-tailed tropicbird	Koae ula	Indigenous
Phoebastria immutabilis (Diomedea immutablis)	Laysan albatross	Moli	Indigenous
Puffinus pacificus chlororhunchus	Wedge-tailed shearwater	Uau kani	Indigenous
Puffinus auricularis newelii	Newell's/Townsend's shearwater	Ao	Indigenous
Sterna fuscata	Sooty tern	Ewaewa	Indigenous

Table 3-12. MBTA-Listed Bird Species at MCB Hawaii Kaneohe Bay

Scientific Name	Common Name	Hawaiian Name	Origin
Sula dactylatra	Masked booby	ʻA	Indigenous
Sula leucogaster	Brown booby	ʻA	Indigenous
Sula sula rubripes	Red footed booby	ʻA	Indigenous
Land Birds			
Alauda arvensis	Skylark		Introduced
Asio flammeus sandwichensis	Short-eared owl	Pueo	Endemic
Cardinalis cardinalis	Northern cardinal		Introduced
Carpodacus mexicanus	House finch		Introduced
Mimus polyglottos	Northern mockingbird		Introduced
Tyto alba	Common barn owl		Introduced
Migratory Birds			
Anas acuta	Northern pintail	Koloa mapu	Migratory
Anas Americana	American wigeon		Migratory
Anas clypeata	Northern shoveler	Koloa moha	Migratory
Anas crecca	Green-winged teal		Migratory
Arenaria interpres	Ruddy turnstone	Akekeke	Indigenous/ Migratory
Aythya affinis	Lesser scaup		Migratory
Aythya marila	Greater scaup		Migratory
Branta bernicla	Brant		Migratory
Branta bernicla nigricans	Black brant		Migratory
Branta canadensis	Canada goose		Migratory
Bucephala albeola	Bufflehead		Migratory
Calidris alba	Sanderling	Hunakai	Indigenous/ Migratory
Calidris alpina	Dunlin		Migratory
Catoptrophorus semipalmatus	Willet		Migratory
Charadrius semipalmatus	Semipalmated plover		Migratory
Childonias niger	Black tern		Migratory

Table 3-12. MBTA-Listed Bird Species at MCB Hawaii Kaneohe Bay

Scientific Name	Common Name	Hawaiian Name	Origin
Falco peregrines	Peregrine falcon		Migratory
Gallinago gallinago	Common snipe		Migratory
Heteroscelus incanus	Wandering tattler	Ulili	Indigenous/ Migratory
Larus atricilla	Laughing gull		Migratory
Larus delawarensis	Ring-billed gull		Migratory
Larus pipixcan	Franklin's gull		Migratory
Limnodromus spp.	Dowitcher		Migratory
Limnodromus scolopaceus	Long-billed dowitcher		Migratory
Lophodytes cucullatus	Hooded merganser		Migratory
Numenius phaeopus	Whimbrel		Migratory
Numenius tahitiensis	Bristle-thighed curlew	Kioea	Migratory
Pandion haliaetus	Osprey		Migratory
Phalaropus fulicarius	Red phalarope		Migratory
Plegadis chihi	White-faced Ibis		Migratory
Pluvialis fulva	Pacific golden plover	Kolea	Indigenous/ Migratory
Pluvialis squatarola	Black-bellied plover		Migratory
Sterna antillarum	Least tern		Migratory
Sterna bergii	Great crested tern		Migratory
Sterna caspia	Caspian tern		Migratory
Sterna fuscata	Sooty tern	Ewaewa	Migratory
Sterna hirundo	Common tern		Migratory
Tringa flavipes	Lesser yellowlegs		Migratory
Tringa melanoleuca	Greater yellowlegs		Migratory

Source: MCBH 2006a; *Draft 2011 INRMP Update (in progress)*

Invasive Species

Invasive plant and animal species are a constant control concern at MCB Hawaii Kaneohe Bay. Invasive species dominate the terrestrial area of MCB Hawaii Kaneohe Bay. In the marine environment, invasive algae species are established in some shoreline areas, such as the sea plane ramp area.[18] The USFWS inventory of coastal and marine resources at the base (USFWS 2008) documented 12 marine non-indigenous species considered invasive, including five algae, four invertebrates, and three fish species. The spread of invasive alien species is considered a threat to marine biological diversity.

Habitat

Critical Habitat. MCB Hawaii Kaneohe Bay does not contain designated critical habitat. The National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), has published a proposed rule (*Federal Register,* June 2, 2011) to expand critical habitat for the endangered Hawaiian monk seal *(Monachus schauinslandi)* around the main Hawaiian Islands, potentially including shorelines and offshore waters around MCB Hawaii properties where monk seals are found. However, NOAA has determined that MCB Hawaii is "ineligible" for such designation, citing that the MCB Hawaii Integrated Natural Resources Management Plan (INRMP) "demonstrated potential conservation benefits for the species, a strong history of plan implementation, and a clear structure to ensure plan effectiveness; thus, the plan was found to be a benefit to the species."

Jurisdictional Wetlands. MCB Hawaii Kaneohe Bay has a number of wetlands located throughout the base. Jurisdictional wetlands (pursuant to the Clean Water Act and administered by the U.S. Army Corps of Engineers) include Nuupia Ponds WMA and six other smaller wetlands (Hale Koa wetland, Sag Harbor wetland, Salvage Yard wetland, Percolation Ditch, Motor Pool, and Kaneohe Klipper Golf Course Ponds). Figure 3-6 shows the location of these wetlands (USACE 2009). The wetlands, including mudflats, shallow ponds, estuarine and coastal wetlands, provide habitat for waterbirds. These waterbirds include the endangered Hawaiian stilt (aeo, *Himantopus mexicanus knudseni*), Hawaiian gallinule (alae ula, *Gallinula chloropus sandvicensis*), Hawaiian coot (alae keokeo, *Fulica americana alai*), and Hawaiian duck (koloa moali, *Anas wyvilliana*) (USACE 2009). No wetlands, including jurisdictional wetlands, are located within the areas proposed for development under Alternative A or B.

[18] Personal Communication, Dr. Diane Drigot, Environmental Department, MCB Hawaii Kaneohe Bay, 2011.

Coral Reefs. USFWS conducted an inventory of coastal and marine resources at MCB Hawaii Kaneohe Bay (USFWS 2008). Marine resources were surveyed within the 500-yard security buffer zone around Mokapu Peninsula. The 500-yard (yd) (457-m) security buffer zone was divided into 11 study areas and focused on nearshore coral reef species and habitats. Three study areas (see Figure 3-7), surveyed in September 2004, are potentially relevant to the proposed action and described here.

Study Area 10 encompassed the near-shore waters fronting the hangars and runway. Transects were located at three survey stations, including one in the vicinity of the site proposed for construction of HMLA facilities. This transect (10A) was located approximately 150 ft (46 m) from shore at a depth of about 24 ft (7 m). Highly modified by previous dredging activities, the substrate was primarily composed of mud. No coral colonies were recorded within this transect.

More extensive coral growth was found at the other survey stations within Study Area 10, fronting Hangars 103 and 104 (station 10B) and the taxiway near Hangar 105 (station 10C). Coral cover at station 10B was estimated at 42 percent, composed of *Montipora capitata, Porites compressa,* and *Pocillopora damicornia*. At station 10C coral cover was estimated at 67 percent, composed of *Montipora capitata* and *Porites compressa*.

Study Areas 8 and 9 were offshore from West Field, as shown in Figure 3-7. Study Area 8 extended from Pyramid Rock to the ordnance assembly area, and Study Area 9—which included the seagrass transects—fronted the Hale Koa/Waterfront Operations area.

Study Area 8 included three survey stations located in high wave energy environments with little coral growth. No coral species rare to the main Hawaiian Islands were observed. Estimated coral coverage at the survey station 8A transects, approximately 1,400 ft (427 m) from shore, was 15 percent, dominated by *Pocillopora meandrina, Montipora flabellata, M. patula*, and *Porites lobata*. Survey station 8B, approximately 1,000 ft (305 m) from shore, had an estimated coral coverage of 35 percent. Dominant species were the same as those observed at station 8A. Transects at survey station 8C, located approximately 2,000 ft (610 m) offshore, showed estimated coral coverage of 3 percent, dominated by *Montipora capitata, M. flabellate*, and *Porites lobata.*

Study Area 9 included survey stations 9A, 9B, and 9C, plus additional transects for the seagrass survey referenced above. No corals were observed at the seagrass transects. Transects for survey station 9A, located approximately 1,200 ft (366 m) offshore, had an estimated coral coverage of 68 percent. *Porites compressa* accounted for more than half of the colony numbers and colony cover, followed by *M. capitata*. At survey station 9B, approximately 800 ft (244 m) offshore, estimated coral coverage was 53 percent. *M. capitata* accounted for more than 90 percent of the colony numbers and coral cover. Survey station 9C, approximately 500 ft (152 m) offshore, had an estimated coral cover of 91 percent, with *Porites compressa* being the dominant species.

Existing Management Measures

This section addresses existing measures implemented by MCB Hawaii Kaneohe Bay to address issues relating to biological resources.

Integrated Natural Resources Management Plan (INRMP). MCB Hawaii implements natural resources control, management, and monitoring programs at all of its installations, including MCB Hawaii Kaneohe Bay. The base is responsible for preparing and updating an INRMP, in accordance with the Sikes Act (16 U.S.C. 670a-670f, as amended), which requires DoD to carry out programs and implement strategies to conserve and protect biological resources on its land. The MCB Hawaii INRMP provides tools to ensure that military operations and natural resources conservation are integrated and consistent with stewardship and legal requirements (Drigot, Wilcox, and Duin 2001). The first MCB Hawaii INRMP/EA was published in 2001, covering the time frame 2002–2006; and the first five-year update of that document was published in 2006, covering the time frame 2007–2011. Information from both of these INRMP documents is referenced, as appropriate, in this EIS. The second five-year update of the INRMP was published in 2011, covering the timeframe 2012 to 2016.

The INRMP continues to follow an ecosystem management approach to addressing areas of concern. Objectives and action items directly relevant to the proposed action are listed here.

- Assist implementation of a Bird Aircraft Strike Hazard (BASH) Management Program at MCB Hawaii Kaneohe Bay's airfield.
  - Ensure continuation and improvement of established BASH data collection and management system by MCAS and USDA/Wildlife Services staff.
  - Track airfield staff in proper execution of BASH program responsibilities as spelled out in the current BASH Plan, and regularly update the plan as required.

- Incorporate BASH considerations into airfield and other base scopes of work, plans, and project specifications.[19]

- Track and manage impacts of other agency plans on MCB Hawaii's protected/pest species management strategies. Participate in interagency initiatives on invasive species problems.
- Take a watershed approach to characterize and develop solutions to flooding, erosion, and other watershed health issues.
- Implement BMPs to improve watershed health. Review and update all relevant plans and Standard Operating Procedures (SOPs) to integrate BMPs. Incorporate BMPs into guidelines, operating, and evaluation procedures. Ensure adequate awareness-building and training about BMPs, watershed health, and water quality.

MCBH Environmental Compliance and Protection Standard Operating Procedures (ECPSOP). The ECPSOP, updated in December 2005, is intended to provide an orientation to the Marine Corps base population on its responsibility to comply with environmental laws on the installation. Included in the document is a chapter on natural resources management SOPs. The ECPSOP is targeted to a general audience. It highlights applicable statutes, program elements, and responsibilities of various component programs and staff. The Environmental Management chapter provides information to help personnel understand what they must do to comply and where they can get additional help to remain in compliance.

Bird Aircraft Strike Hazard (BASH) Plan. MCAS Kaneohe Bay has developed a BASH Plan (MCAF 2006) to reduce the risk of air strikes involving birds, including resident and migratory bird species. Flight Operations and the Air Station are responsible for clearing birds from the runways and taxi approaches. The BASH Plan, tailored to specific conditions and operations, provides guidance to minimize bird strike hazards to military aircraft operating at MCAS Kaneohe Bay. As part of the BASH Plan, MCAS established a Bird Hazard Working Group and established procedures to identify high hazard situations and to aid aircrews in determining if altering/discontinuing flying operations are required. The plan outlined aircrew operating procedures to avoid high-hazard situations and procedures to decrease the attractiveness of the airfield to birds by eliminating, controlling, or reducing environmental factors which

[19] For example, advise facilities planners and design engineers and others working on flightline and other infrastructure to ensure that airfield and other night lights are down-shielded to minimize attraction of federally-protected seabirds such as shearwaters.

support the birds. In addition, it disseminated information to all assigned and transient aircrews on bird hazards and provided guidelines for dispersing birds on the airfield.

Birds are regularly hazed from the flightline area by USDA Wildlife Services staff, under permits from the USFWS. The MCB Hawaii Environmental Compliance and Protection Department (ECPD) Natural Resources Section secures the Depredation Permit from USFWS for MCAS operations and ensures compliance by USDA Wildlife Services staff. Oahu is the home of a growing population of cattle egrets (*Bubulcus ibis*), and a significant congregation occurs at MCB Hawaii Kaneohe Bay. Cattle egrets prefer open fields where they can feed on insects. Control methods are in place through the BASH Plan, such as hazing birds from the flightline area. Great frigate birds (iwa or *Fregata minor palmerstoni)* present a substantial aviation hazard. These large birds periodically fly around "Tower Hill" east of the runway at traffic pattern altitude (MCAF 2006).

The runway areas are kept clear of most vegetation except grasses. Grasses are mowed periodically to maintain the airfield and for BASH control. Experience has shown that regular mowing is the best practice, since it reduces grass seed production and grass biomass, which provide food for birds that pose BASH risks.[20]

MCB Hawaii Kaneohe Bay manages seasonal arrivals of federally protected Laysan albatrosses (*Phoebastria immutabilis*) from October through February each year. Suitable albatross resting/nesting habitat does exist at the base but is incompatible with military activities at these locations. Albatrosses are among the bird species covered in the BASH Plan that are discouraged from becoming habituated to the airfield area. Occasionally, there is a need for more deliberate action. In cooperation with state and federal regulators, the birds and/or their eggs are relocated to Kaena Point Natural Area Reserve on the other side of Oahu where a small breeding colony is established. Annual reports are submitted to USFWS and the State Department of Land and Natural Resources (DLNR), in conjunction with permits issued for these bird transfer activities (Drigot, Wilcox, and Duin 2001; MCBH 2006a, Draft 2001 MCBH INRMP update).

Invasive Species. Existing invasive species control programs include regular removal of mongoose, feral cats, and rats from protected bird sanctuaries, as well as a continuing focus on invasive plant control efforts for Nuupia Ponds WMA, Ulupau Head WMA, and other wetlands frequented by endangered waterbirds and migratory waterfowl. SOPs, including

[20] Russell, Todd. Personal communication. July 22, 2011.

education, monitoring, and control, are in place to deter the transport of invasive species to and from MCB Hawaii Kaneohe Bay (NFESC 2002b; Drigot, Wilcox, and Duin 2001; MCBH 2006a).

As an example of the ongoing invasive species control program, MCB Hawaii natural resources staff recently removed a patch of fountain grass (*Pennisetum setaceum*) found growing along the fence line by the motor pool where vehicles that are transported back and forth to PTA are stored. Fountain grass is a highly flammable invasive plant prevalent on the Big Island but rare on Oahu. Due to the ongoing vigilance of environmental staff, this patch was detected and removed, and the importance of vehicle inspection was stressed with appropriate personnel.[21]

The spread of invasive alien species is considered a threat to marine biological diversity. The MCBH Coral Reef Ecosystem Management Study (2002) and MCBH Invasive Species Management Study (2002) present recommendations to address this threat (MCBH 2006a).

Wildland Fires. Marine Corps Order (MCO) P5090.2A Ch 12, published in May 2009, mandated that Marine Corps installations with burnable acreage, or bordered by burnable acreage, develop and implement a Wildland Fire Management Plan (WFMP). MCB Hawaii already had in place various studies, SOPs, and plans to respond to and address fire risk. MCO P5090.2A Ch 2 now provides clearer guidance for the standards, components, and programs to be consolidated into a centralized plan. Since most of the highly flammable acreage and fire history at MCB Hawaii is within or immediately adjacent to range and training areas, MCB Hawaii Operations and Training (O&T) Directorate has taken a leadership role in compliance with this mandate and has financed the development of a wildland fire management plan and environmental assessment covering range and training areas. MCB Hawaii's focus on invasive vegetation management to reduce fire risk complements the wildland fire management planning efforts. While the wildland fire management plan and EA are underway (targeted for completion in early 2012), MCB Hawaii's O&T Directorate's wildland fire management and response protocols are embodied in Base Order 3302.1, All Hazards Force Protection Plan, Appendix 11: Fire Response Management.[22]

Complementing these initiatives are INRMP actions identifying areas of highest wildland fire risk. Actions include developing vegetation management strategies for the ranges and funding

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[21] Drigot, Dr. Diane. Personal communication. May 1, 2011.

[22] Drigot, Dr. Diane. Personal communication. July 2, 2011.

projects to reduce invasive, fire-prone grasses and replace them with less flammable ground cover (MCBH 2006a).

Light Emissions. At MCB Hawaii Kaneohe Bay, outdoor lights are shielded when possible to minimize attraction to seabirds such as shearwaters (Drigot, Wilcox, and Duin 2001; MCBH 2006a). MBTA-protected wedge-tailed shearwaters nest in the eastern sand dune pond shoreline of Nuupia Ponds.

3.8.3 ENVIRONMENTAL CONSEQUENCES

Terrestrial and Marine Flora

The only naturally occurring ESA-listed plant species at MCB Hawaii Kaneohe Bay is the endangered *Sesbania tomentosa* (ohai) plant discovered in a location within the Nuupia Ponds WMA. This area would not be directly affected by construction and operations under Alternative A or B. Indirect effects, e.g., from surface water runoff, would be minimized with the use of BMPs to avoid or minimize runoff. Similarly, native seagrass found offshore would not be affected during construction or operations, given the location of the seagrass beds and implementation of BMPs to avoid or minimize storm water runoff into nearshore waters. Therefore, no significant impacts are expected under either Alternative A or B; no additional mitigation beyond implementation of BMPs is required. The No Action Alternative would have no impacts on terrestrial or marine flora.

Terrestrial and Marine Fauna

ESA-listed and MBTA-listed birds are found mainly within the WMAs and in other ACOE-designated jurisdictional wetlands, but some are present in developed, landscaped areas (e.g., Pacific golden plovers [kolea] on lawns). No effect on ESA-listed or MBTA-listed bird is expected under either Alternative A or B, as the habitats (WMAs or jurisdictional wetlands) of these birds would not be affected by the proposed action. Certain MBTA-listed birds (Laysan albatross, great frigate birds) and other non-ESA- or MBTA-listed land bird species (e.g., mynahs, rice birds, Java sparrows, bulbuls, etc.) are known to pose a potential hazard to aircraft in the runway area proposed for development. Programs implemented under the INRMP and the BASH Plan are currently in place to protect and monitor ESA- and MBTA-listed species. For example, the use of down-shielded lights at hangars and other buildings to the maximum extent feasible would prevent seabirds such as wedge-tailed shearwaters from being attracted to areas with aircraft operations. With continued implementation of these programs, no significant impact on these species would be associated with Alternative A or B. No additional mitigation would be required.

With the No Action Alternative, no impacts are anticipated on ESA- or MBTA-listed birds.

ESA-listed marine species frequent ocean waters around Mokapu Peninsula. These offshore waters are not within the vicinity of areas proposed for use by the new squadrons. As discussed in the section on drainage and water quality (Section 3.7), projects would be carried out in compliance with NPDES permit requirements, including implementation of BMPs, and storm water runoff during operations can be managed with LID practices. As a result, no significant impacts are expected under any of the alternatives and no mitigation is required.

Invasive Species

Management programs are in place to control the spread of invasive species. No mitigation beyond implementation of existing SOPs is required for either action alternative or for the No Action Alternative.

Habitat

Critical Habitat. No critical habitat is designated at MCB Hawaii Kaneohe Bay; therefore, no impacts are expected under any of the alternatives. No mitigation is required.

Jurisdictional Wetlands. There are no jurisdictional wetlands located within the ROI for Alternative A or B. Appropriate BMPs would be in place during construction to prevent sediment runoff into wetlands such as at Sag Harbor and Hale Koa beach (Alternative B). No mitigation is required. With No Action, there would be no impacts on wetlands.

Coral Reefs. No coral reefs are located in the vicinity of development proposed under Alternative A or B. As shown in Figures 2-3 and 2-16, Hangar 101 and existing aprons would be improved for use by the HMLA squadron under Alternatives A and B; these facilities are located close to the shoreline, west of the marina. In the USFWS inventory described above, no coral colonies were identified at the survey station located in the vicinity of the proposed HMLA facilities. In the waters fronting West Field, where MV-22 facilities would be developed under Alternative B, coral colonies were recorded at transects located approximately 500 ft (152 m) from the shoreline occupied by Waterfront Operations. Storm water runoff from the Alternative B MV-22 site via existing storm drains could impact nearshore water quality during construction and operations. For either alternative, appropriate BMPs would be in place during construction to prevent sediment runoff into coastal waters. Operational impacts would be minimized by incorporating LID or other features into facilities design. No additional mitigation is required. With No Action, there would be no impacts on coral reefs.

Bird Aircraft Strike Hazard (BASH)

Continued implementation of MCB Hawaii Kaneohe Bay's BASH Plan would reduce the risk of bird air strikes associated with the proposed aviation activities. No other mitigation is required.

Wildland Fires

The Department of the Navy, Naval Air Systems Command (NAVAIR), has assessed the risk of grass fire due to hot exhaust of the MV-22. See Appendix F-1. [23] When in the tiltrotor configuration ("helicopter mode"), the MV-22 aircraft's engine exhaust is directed downward. This places the engine exhaust exit 4.33 ft (1.32 m) above the ground. To reduce heating of the ground and aircraft components, the MV-22 incorporates an exhaust deflector system, which directs the exhaust outward, away from the aircraft and the ground. With exhaust deflectors off, the MV-22 exhaust temperature at the exit plane is 515° Fahrenheit (F) (268° Celsius [C]) above ambient temperature, decreasing to 150° F (66° C) above ambient temperature at a distance of 4.33 ft (1.32 m) above the ground. At the time of the NAVAIR assessment (2008), there had been one documented grass fire attributed to MV-22 exhaust. The probable cause of the fire was an inoperative exhaust deflector. NAVAIR conducted a safety assessment of grass fire risk caused by hot exhaust, taking into account circumstances such as rigid vegetation (bushes, brush) extending higher into the exhaust stream and leaking fuel or hydraulic fluid after an extended period with the engines shut down. NAVAIR assessed the predicted frequency of a catastrophic grass fire event as Remote. (See Appendix B-2, NAVAIR System Safety Risk Assessment Matrix. Hazard categorizations, from lowest to highest frequency, are as follows: Improbable, Remote, Occasional, Probable, Frequent.) Available data indicates that under normal operations, with exhaust deflectors operating, MV-22 exhaust should not heat ground to a temperature high enough to support combustion of plant based materials. Since the time of the 2008 NAVAIR assessment, a second grass fire has been ignited by the aircraft's exhaust. As of July 22, 2011, after approximately 110,000 MV-22

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[23] Memo from PMA-275 Program Manager, Department of the Navy, Program Executive Officer, Air ASQ Assault and Special Mission Programs, to Headquarters, Marine Corps, Department of Aviation, Aviation Logistics Support Branch, on Risk of Fire from V-22 Exhaust, July 21, 2008; included in *West Coast Basing of the MV-22 Final EIS*, October 2009, Volume III, Appendix G-1.

and CV-22[24] flight hours combined[25] and operations to numerous unprepared (unpaved) LZs, the rate for reported grass fires ignited by MV-22 exhaust is "Occasional."[26]

MV-22 operations at unprepared surfaces can be safely accomplished. Additional operational measures such as avoiding vegetation directly beneath the aircraft and limiting time the aircraft is on the ground at unprepared LZs would further minimize this already remote risk. It is noted that the MV-22 would be operating at MCB Hawaii Kaneohe Bay at paved airfield and LZ surfaces. Given these conditions, the aircraft deflector systems, and the base's existing wildland fire management and response protocols, the risk of wildland fire caused by MV-22 exhaust is unlikely. No additional measures are required.

Summary

Potential development impacts on biological resources would be the same under Alternatives A and B. None of the proposed construction projects in either alternative are in the vicinity of ESA-listed plant species, endemic seagrass found offshore, wetlands, or coral reefs. ESA-listed terrestrial and marine faunal species and MBTA-listed birds are found at MCB Hawaii Kaneohe Bay. With existing natural resource management measures, the proposed aviation activities—which would be the same under either action alternative—would have no effect on these listed species. BASH, invasive species, and wildland fire risks would be managed through compliance with applicable base orders, plans/policies, and SOPs. With the No Action Alternative, there would be no additional impacts on biological resources.

3.9 CULTURAL RESOURCES

3.9.1 INTRODUCTION

Cultural resources are archaeologic, historic and traditional cultural properties that reflect our heritage and are considered important to a culture, a subculture, or a community for scientific, traditional, religious, or any other reason. Federal regulations define historic properties to include prehistoric and historic sites, buildings, structures, districts, or objects listed or eligible for listing in the National Register of Historic Places (NRHP), as well as artifacts, records, and remains related to such properties (National Historic Preservation Act [NHPA], as amended [16 U.S.C. 470 et seq.]). Additionally, cultural resources are protected under the Archeological Resource Protection Act (ARPA) (16 U.S.C. 470aa-9 470mm; Public

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[24] CV-22 is the Air Force version of the MV-22.

[25] MV-22 and CV-22 aircraft combined;

[26] Bein, Don. Personal communication. August 12, 2011 and September 13, 2011; and enclosure "NAVAIR System Safety Risk Assessment Matrix."

Law 96-95 and amendments), and the Native American Graves Protection and Repatriation Act (NAGPRA) (Public Law 101-601; 25 U.S.C. 3001-3013). The procedures for complying with Section 106 of the NHPA, which directs federal agencies to take into account the effect of a federal undertaking on a historic property, are outlined in the Advisory Council on Historic Preservation's (ACHP's) regulations, "Protection of Historic Properties" (36 CFR Part 800). The NHPA and associated Section 106 regulations also include provisions for Native Hawaiian consultation regarding cultural significance of potential religious and sacred artifacts (16 USC 470a [a][6][A] and [B]).

This section identifies cultural resources at MCB Hawaii Kaneohe Bay and assesses effects on these resources due to the proposed action. Section 3.9.1 provides definitions. Section 3.9.2 describes the existing environment, including its historic context and cultural resources. For clarity, the resources are divided into two sections: archaeological and traditional cultural resources and historic buildings. Section 3.9.2.2 presents an assessment of potential impacts and whether they are considered adverse. Because of differences between Alternatives A and B in terms of siting of the VMM squadron facilities and plans for BEQ demolition and construction, cultural resource effects would differ between the action alternatives.

Definition of Resources

Cultural resources are defined by various federal laws, regulations, and Executive Orders (EOs), including this definition by the ACHP (brackets added) (ACHP 2001).

> Cultural resources are generally defined by federal agencies to mean the same thing as historic properties [per the National Historic Preservation Act, or NHPA], although there is no consistent legal definition, and individual agencies and organizations use different emphases. Under 10 USC § 2684, which deals with Department of Defense's responsibilities to manage "cultural resources," such resources are defined to include properties included in or eligible for inclusion in the National Register of Historic Places [NRHP], cultural items defined by the Native American Graves Protection and Repatriation Act [NAGPRA], archaeological resources as defined by the Archaeological Resources Protection Act [ARPA], and archaeological artifact collections and associated records [as defined by 36 CFR Part 79].

MCB Hawaii manages cultural resources in accordance with the laws, regulations, and guidance summarized above, as well as DoD Instruction 4715.16, Cultural Resource Management, and MCO 5090.2A, Change 2, *Environmental Compliance and Protection Manual*.

In addition, the MCB Hawaii Integrated Cultural Resources Management Plan (ICRMP) (USACE 2006) provides specific guidance for the base.

A*rchaeological sites* are defined as the physical remains of past human activities. Federal regulation implementing NHPA includes archaeological resources in the category of "site," which is "the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archeological value regardless of the value of any existing structure" (36 CFR Part 60.3[l]).

The term *traditional cultural resource* includes a range of resource types defined in various federal laws and regulations. It includes traditional cultural properties (TCPs) under definitions of the NHPA, which separates "culture" from other categories of historic properties (in American history, architecture, archaeology, engineering, and *culture*; see 36 CFR Part 60.1[a]). Traditional cultural resources not covered by the NHPA include sacred sites as defined by EO 13007, and cultural items defined by NAGPRA as human remains, funerary objects, sacred objects, and objects of cultural patrimony. Traditional cultural resources may or may not include physical remains. As stated in 36 CFR Part 60.3, sites can be "standing, ruined, or vanished, where the location itself possesses cultural value." They may be places that are recalled in legends, memorialized by place names, or associated with cultural practices, beliefs, or customs. Some or all of these places may be *wahi pana*, which can be translated as "celebrated place" or "storied place" (Pukui and Elbert 1986:313).

Evaluations of NRHP Eligibility

Cultural resources covered under NHPA—including archaeological sites, TCPs, and buildings and structures—are evaluated for *significance* using criteria established under NHPA to determine eligibility for inclusion in the NRHP, as stipulated in 36 CFR Part 60.4:

> The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded, or may be likely to yield, information important in prehistory of history.

To qualify as a National Historic Landmark (NHL), a property must be of exceptional national significance.

In this EIS, archaeological resources, traditional cultural resources, and historic buildings and structures that have been assessed under the NRHP criteria are listed as “eligible” (under the specified significance criteria). If the formal process of nomination to the NRHP has been completed, the site is noted as being “listed” in the NRHP. Resources that are eligible or listed in the NRHP are termed “historic properties.”

Definition of Undertaking, Impacts, Area of Potential Effect, and ROI

An *undertaking* is defined under NHPA Section 106 regulations as a “project, activity or program funded in whole or part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval” (36 CFR 800.16 (l)(1)).

Under 36 CFR Part 800, *effects* to historic properties are determined by the amount of loss of integrity of those resources. An undertaking adversely affects a historic property if it alters the characteristics that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property. “Integrity” is the ability of a property to convey its significance, based on its location, design, setting, materials, workmanship, feeling, and association. Adverse effects can be direct or indirect. They can include reasonably foreseeable impacts that may occur later in time or be farther removed in distance.

Under NEPA, whether an action will have a significant impact on cultural resources is determined based on the context and intensity of the impact. While an action (undertaking) could be determined under 36 CFR Part 800 to have an adverse effect on historic properties, the context or intensity of that adverse effect may not be such that it constitutes a significant impact under NEPA. As an example, demolition of a single contributing element of a historic district would likely constitute an adverse effect under 36 CFR Part 800, but if it was one of many buildings, or a building type that continues to be well-represented in the district, the context and intensity of the impact would not be considered significant under NEPA.

Damage, loss, or disturbance to Native Hawaiian human remains would be an impact under NAGPRA. Loss of access to sacred or ceremonial areas would be an impact under the American Indian Religious Freedom Act (AIRFA, Public Law No. 95-341, 92 Stat. 469, dated August 11, 1978, codified at 42 U.S.C. § 1996), enacted to protect and preserve traditional religious rights and cultural practices of American Indians, Eskimos, Aleuts, and Native Hawaiians.

Under the National Environmental Policy Act (NEPA), impacts are assessed within a specific ROI. For the purposes of NHPA, historic properties are analyzed within the *area of potential effects (APE)* of the undertaking. APE is defined at 36 CFR Part 800.16(d) as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist." The APE differs for NRHP-eligible archaeological and traditional cultural resources and historic buildings. The APEs for archaeological resources at MCB Hawaii Kaneohe Bay are the specific locations of proposed projects and activities, as identified in Chapter 2, in particular, areas of ground disturbance and including building footprints and construction staging areas. For purposes of this EIS, the APE at a landing zone is the area defined by the perimeter of the LZ plus a 350-ft (107-m) buffer around the perimeter. The buffer addresses possible impacts from MV-22 rotor downwash. See Appendix F-2 for a memorandum describing downwash from the rotor of an MV-22 aircraft hovering at 20 ft (6 m) AGL.

The APE for traditional cultural resources includes the specific locations of proposed projects and activities, as well as areas that may also be affected by visual (e.g., viewsheds) and auditory (e.g., noise) impacts of development and/or use, if those visual and auditory features contribute to characteristics that qualify the property for inclusion in the NRHP, i.e., the site's "integrity of location, design, setting, materials, workmanship, feeling, and association" (36 CFR Part 60.4).

For traditional cultural resources covered by laws other than NHPA, the EIS analyzes potential impacts within the appropriate ROI, which may be site specific or a larger area such as a land division or region.

The APE for historic buildings at MCB Hawaii Kaneohe Bay is identified in Figure 3-8. In cases where a NRHP-eligible or listed building is outside this area, the APE would be the building footprint. Viewsheds for NRHP-eligible or listed buildings are also included as part of the APE if they contribute to characteristics that qualify the property for inclusion in the NRHP, as described above.

NHPA Section 106 Consultation

Section 106 of the NHPA requires federal agencies to take into account the effects that their federally funded activities and programs have on significant historic properties (36 CFR Part 800). The NRHP is administered by the National Park Service (NPS) in conjunction with the State Historic Preservation Officer (SHPO). The purpose of Section 106 is to balance historic preservation concerns with the needs of federal agencies. This process ensures that federal agencies consider public concerns related to historic properties that have the potential to be affected by federal undertakings. Native Hawaiian organizations and individuals are consulted regarding properties of traditional religious and cultural importance (16 U.S.C. 470a [a][6][A] and [B]).

The Marine Corps is consulting with the SHPO, ACHP, NPS, NHOs and individuals, Historic Hawaii Foundation, National Trust for Historic Preservation, other interested parties, and the public in accordance with Section 106 of the NHPA. A list of the consulting parties is provided in Appendix K. A Programmatic Agreement (PA) is being developed in consultation with the aforementioned consulting parties to document measures that will be implemented in order to avoid, minimize, or mitigate adverse effects that may result from the proposed undertaking.

For cultural resources not defined as historic properties under NHPA, interested parties and the general public were afforded opportunities to provide comments through the NEPA process described in Chapter 1 of this document.

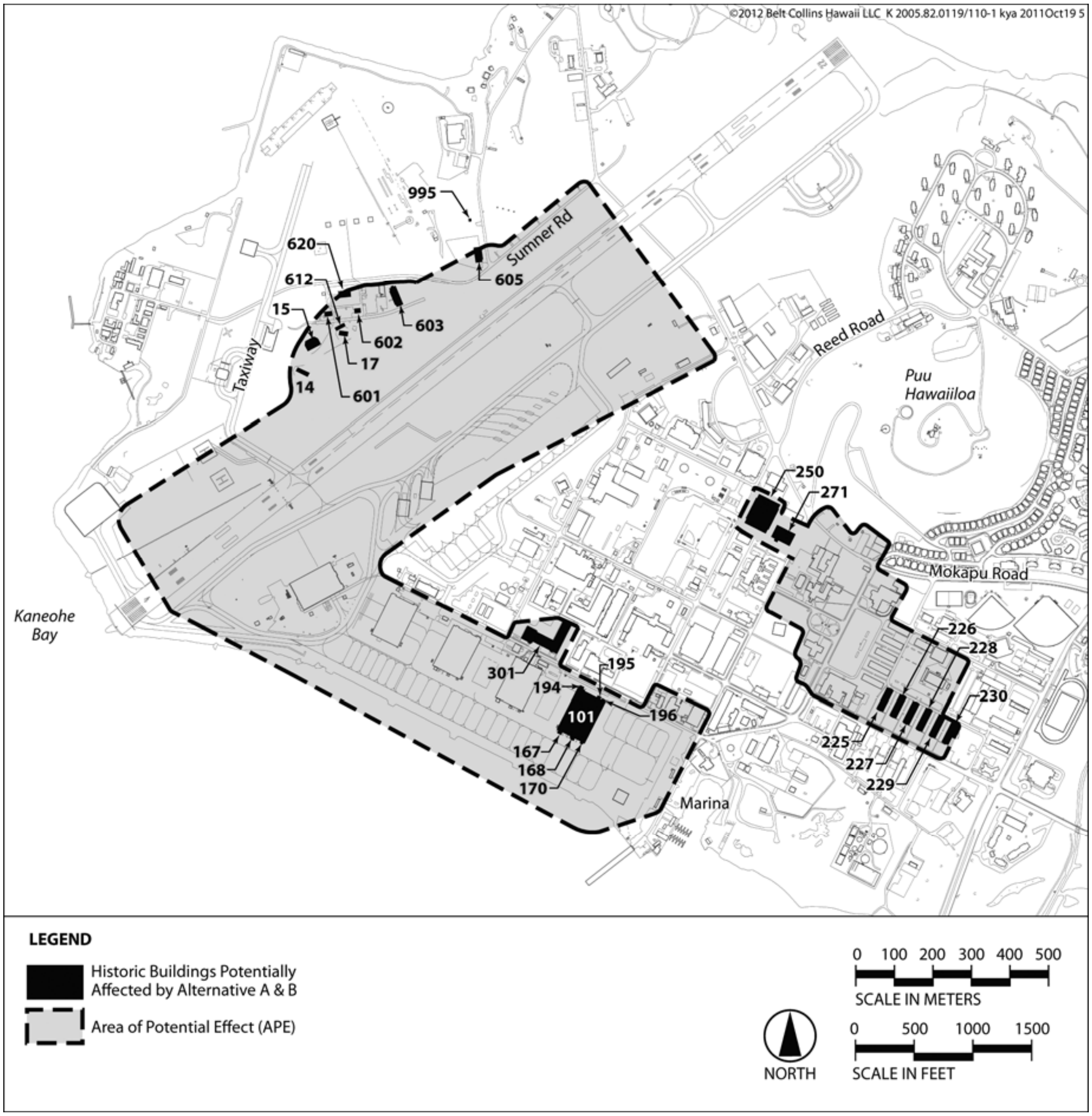

Figure 3-8. NRHP-Eligible or Listed Buildings Within or in the Vicinity of the APE

3.9.2 AFFECTED ENVIRONMENT

3.9.2.1 Historic Context

Pre-Contact Period

MCB Hawaii Kaneohe Bay bears little resemblance to Mokapu Peninsula during the pre-Contact and and early historic periods. Before World War II era dredging and filling transformed the western coastline, Mokapu had a more irregular configuration, and large portions of the peninsula were covered with wetland marshes. Figure 3-9 shows the earlier coastline and the extent of wetlands, based on Brown (1872). Wood charcoal from archaeological sites suggests a dryland vegetation complex on the peninsula (Roberts et al. 2002:45). Although no permanent surface water sources presently exist here, springs and wells have been historically and archaeologically documented (Webster 1851; McAllister 1933:184, 185; Allen 2010:22).

At the time of Western Contact in 1778, Mokapu Peninsula was part of the ahupuaa[27] of Heeia and Kaneohe in the traditional district of Koolaupoko. The western third of the peninsula was within Heeia ahupuaa and the eastern two-thirds fell in Kaneohe ahupuaa. Kaneohe ahupuaa was considered the richest area in the district and among the most productive in the islands (Tuggle and Hommon 1986:6). The portion of Heeia on the peninsula was called the ili of Mokapu. At least four ili were located within the Kaneohe ahupuaa: Heleloa, Kuwaaohe, Kaluapuhiwaho, and Ulupau. Figure 3-10 illustrates the traditional land divisions and the location of proposed projects and activities at MCB Hawaii Kaneohe Bay within the context of the land divisions.

Archaeological evidence indicates that people lived on or visited Mokapu Peninsula for at least 500 to 800 years before Western Contact. The earliest radiocarbon date for human occupation on the peninsula is from a coastal location on the west side of the peninsula; the site is dated to AD 1037-1309 (Charvet-Pond and Rosendahl 1992a:35; Prishmont et al. 2001:95-96; Gosser et al. 2002:27; Rasmussen 2007b). Radiocarbon dates from elsewhere on the peninsula indicate occupation throughout the entire known sequence of Hawaiian settlement in the islands.

[27] In the traditional Hawaiian organization of land, each island was divided into districts. Districts were subdivided into land units called ahupuaa that served as "administrative units for political purposes but which also had a strong economic character" (Tuggle and Hommon 1986:3) in that each ahupuaa ideally contained the necessary range of resources to support an economically independent community. Ahupuaa were further subdivided into ili that were worked by smaller community or family groups.

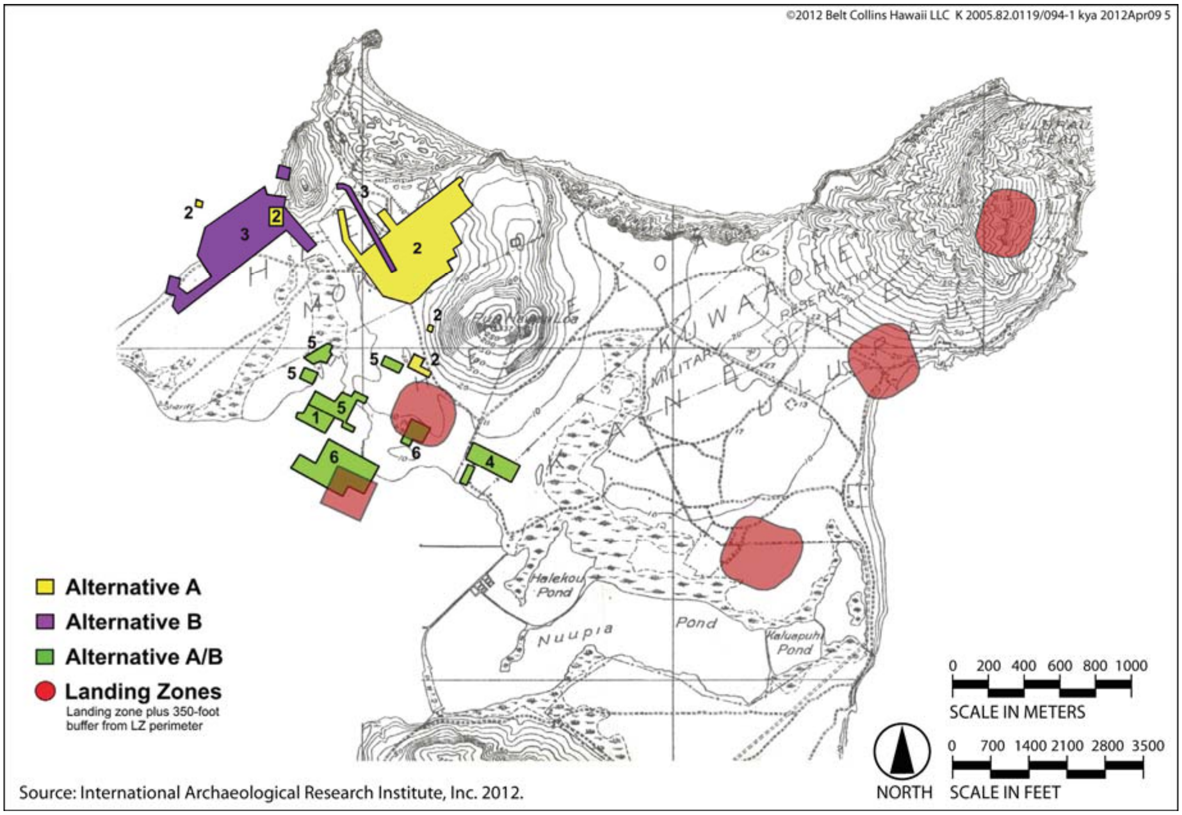

Figure 3-9. Pre-military Land Configuration, MCB Hawaii Kaneohe Bay (base map: Brown 1872), with overlay of projects (numbers keyed to Table 3-13)

Life on the peninsula in the pre-Contact period likely revolved around a cycle of agriculture and fishing. Religious activity focused around shrines dedicated to fostering good harvests and good fishing. An indication that the peninsula held some political significance is the complex of fishponds (Site 1002).[28] The largest pond is Nuupia; to the north of Nuupia is Halekou Pond and to the east is Kaluapuhi Pond. Paleoenvironmental coring in Halekou Pond suggests that it was being used in the AD 15th or 16th century (Athens, 2002:40).

[28] Traditionally, production from fishponds was for the support of the ruling chiefs of an area (Kikuchi 1973). In Koʻolaupoko, Kailua was seat of the ruling chiefs of the district, but it was neighboring Kāneʻohe that had the richest resources, including the Mōkapu fishponds.

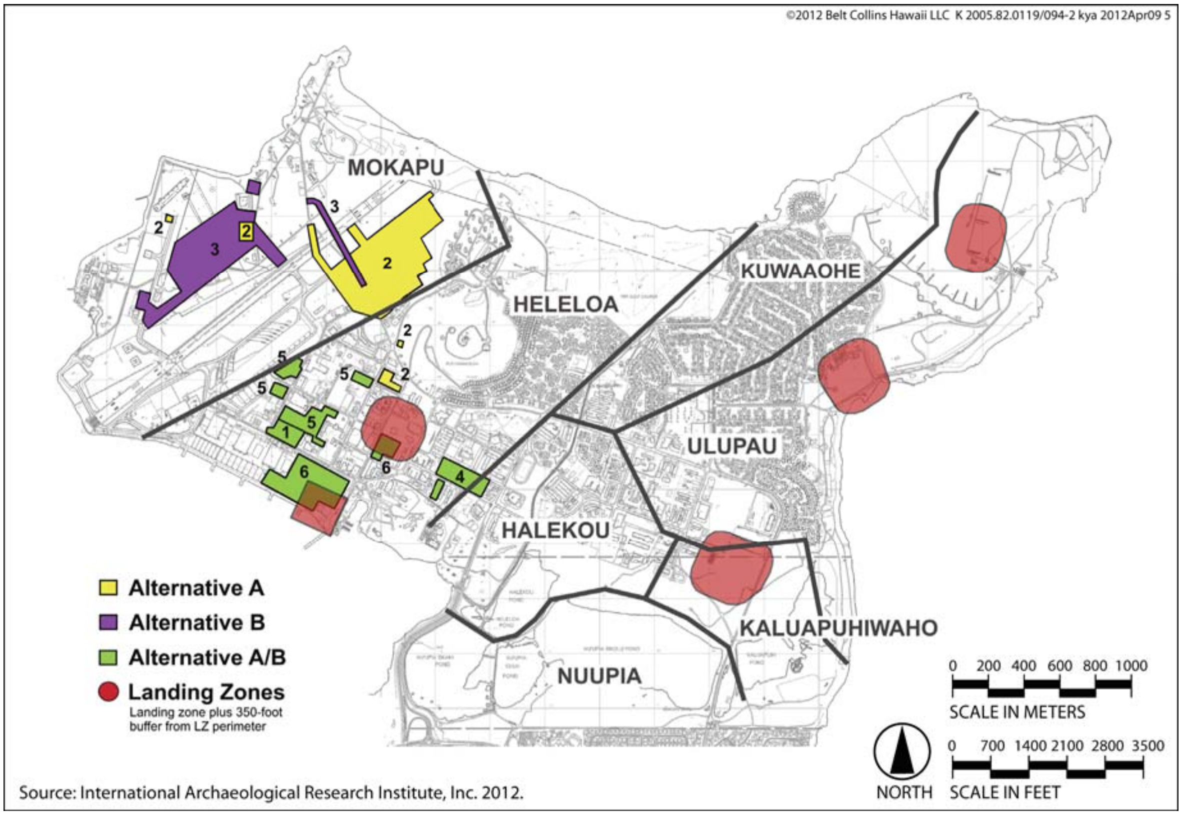

Figure 3-10. Traditional Land Divisions on Mokapu Peninsula (numbers are keyed to Table 3-13)

The Peninsula in the 19th Century

Archaeological evidence suggests that the peninsula was occupied through the 19th century (Tuggle and Hommon 1986:31). In the early post-Contact period, life at Mokapu probably continued in much the same cycle as in earlier times, with small-scale subsistence farming and fishing (Tuggle and Hommon 1986:30). Archaeological excavations in several areas of the peninsula have produced cultural materials indicating probable 19th century occupation (Tuggle and Hommon 1986:31).

In the mid-19th century, two major changes in land tenure occurred: first, all lands were divided among the king, the high chiefs, and the government through a process called the Mahele (Kameeleihiwa 1992); and second, commoners were allowed to claim lands that they used and occupied (called kuleana) through the Land Commission process. Records show that two Mahele awards and four kuleana claims were made. These records provide detail about historic land use describing salt-making in Ulupau and Kaluapuhi, sweet potato and gourd gardens, as well as pandanus trees, in Ulupau, Heleloa, and Kuwaaohe, taro pondfields (location not specified), and houses at Kuwaaohe (PHRI 1995:33-35).

Ranching changed the landscape in the second half of the 19th century. By the turn-of-the-19th century, pastures, fences, windmills, and piers to ship cattle to market marked the Mokapu landscape. MacCaughey (1917:187, 189) described a "treeless pasture…crossed by numerous cattle trails;" Puu Hawaiiloa was covered by grasses in some areas but in many others was "exposed, revealing the brown tufaceous character of the soil." This description suggests that large-scale soil erosion was apparently resulting from overgrazing.

Land Use in the Early 20th Century

The first half of the 20th century saw continued ranching and other activities on the peninsula. Small scale farming included cultivation of a variety of crops, including cotton, watermelons, sweet potato, and corn; many of the farmers were Japanese (Tuggle and Hommon 1986: Figure 11). In 1921, a Territorial game farm was established on the north side of the fishponds; the farm lasted until World War II (Devaney et al. 1976; Tuggle and Hommon 1986:31, Figure 13).

In the late 1920s and 1930s, the northwest area of the peninsula was subdivided into houselots (Drolet et al. 1996:46; Ruzicka and O'Day 2005). Prominent families from Honolulu built wood plank homes for summer relaxation and seasonal excursions.

Military History at Mokapu Peninsula

The beginning of U.S. military presence at Mokapu Peninsula began in 1918, when Woodrow Wilson designated approximately 382 ac (155 ha) on the eastern side for military use. This eastern area has been known as Camp Ulupau, Fort Kuwaaohe, Camp Kuwaaohe, Kuwaaohe Military Reservation, and Fort Hase. Little is known about the facilities or activities during these early years.

In 1938, the Hepburn Board recommended that several new air bases be constructed across the country, and the Naval Air Station (NAS) at Kaneohe Bay was considered to be of particular strategic importance, accommodating five squadrons of seaplanes plus the facilities to support them. Locating planes at this new distant base was viewed as critical to protect fleet anchorages, population centers, and commercial shipping in Honolulu. This was to be the main installation of seaplanes to support the Pearl Harbor fleet.

In 1939, base construction followed the acquisition of 553 ac (224 ha) from the Mokapu Land Company and other owners. In the first few weeks, wooden structures were erected to house the workers. Aircraft hangars, administration buildings, recreation facilities, warehouses, housing, and mess halls appeared shortly thereafter. By the end of 1941, there were about 90 permanent concrete, masonry, and steel facilities, about 60 temporary wooden facilities, and 465 ac (188 ha) had been added to the base. The eastern area of the Mokapu peninsula (Fort Hase) was incorporated into NAS Kaneohe Bay in 1947.

December 7th Attack

In the early hours of December 7, 1941, three of the 36 seaplanes stationed at NAS Kaneohe Bay were out on patrol and the remaining 33 were aligned wing tip to wing tip on the parking apron and moored by the ramps outside of the hangars. Only four aircraft were protected inside Hangar 1.

Japanese aircraft detected by radar were thought to be a group of U.S. B-17 bombers scheduled to land at Hickam Air Force Base that morning. Shortly before 8AM, the Japanese strafed and bombed nearly all of the seaplanes and flew away from the first wave of the attack without a loss. Sailors and airmen on the ground reacted immediately, firing at the Japanese Zeros. However, they were only slightly more prepared when the second wave of the attack came 45 to 55 minutes later. By the end of the attack, 18 sailors and two civilians were dead and 67 wounded. All 33 of the planes in the hangar area were destroyed or severely damaged. Hangar 1 was severely damaged by fire.

John William Finn, a 32-year old Chief Petty Officer, received the Medal of Honor for his actions during the first wave of the attack. He was the first of 464 recipients of the prestigious award during World War II. It is believed that Finn was responsible for downing the plane flown by 28-year-old Lieutenant Fusata Iida, one of the Japanese commanders during the second wave of the attack. Reportedly, one or two other Japanese planes went down into the ocean.

Reaction to the Attack

Anticipating another attack, the Navy prepared what defenses it had and intensified construction efforts, building several bombproof structures and the two main gun mounts, Battery Pennsylvania and Battery French. Reportedly, NAS Kaneohe Bay had several replacement seaplanes within a week after the attack. During World War II, the focus at NAS Kaneohe Bay included an Assembly and Repair Department for aircraft, a gunnery school known as the Aerial Free Gunnery Unit, bomber crew training, flight training, and survival training.

Four years after the war ended, on June 30, 1949, NAS Kaneohe Bay was deactivated, but the outbreak of war in Korea renewed military focus on the Pacific, and the Marine Corps reopened the base on January 15, 1952 as MCAS Kaneohe Bay.

Cold War (1946–1991)

The end of World War II marked the beginning of the Cold War, a period of political conflict and military tension between communist countries, mainly the Soviet Union and its allies, and the West, primarily the U.S. and its allies. The Marine Corps assigned a series of legendary units to MCAS Kaneohe Bay, including Marine Air Group 13 (MAG-13), the attack/fighter squadrons VMA/VMF-212, VMA/VMF-214, VMF/VMA-232, and the Marine Air Control Squadron 2 (MACS-2). These units were associated with major military exercises in Thailand, the Philippines, and Taiwan during 1956–1962. Between 1953 and 1960, the station supported a series of joint military defense exercises in Hawaii named Eversharp, which repeated simulation of nuclear attacks. In 1959, the Navy assigned the Bullpup guided missile to VMA-212, for its inaugural deployment to the Pacific. It was the first successful tactical air-to-surface missile of the Navy and the Air Force. In 1965, the Navy assigned the Sidewinder air-to-air guided missile to VMF-212. Units from MCAS Kaneohe deployed for sustained combat duty in the Vietnam War during 1965–1970.

Another major tenant mission at Kaneohe during the Cold War was the Missile Impact Location System (MILS) for the Pacific Missile Range (PMR), established on base in 1958. The MILS/PMR control station included a hydrophone bed off shore, a precursor to the Barking Sands Tactical Underwater Range (BARSTUR) associated with the Pacific Missile Range Facility (PMRF) on Kauai a decade later. In 1968, the Naval Undersea Warfare Center (NUWC) took over the MILS/PMR compound at Kaneohe, converting and expanding it as a major laboratory for undersea acoustics, marine mammal studies, and Navy weapons development.

3.9.2.2 Archaeological Resources

The following sections are based on a review of previous archaeological reports and the *Integrated Cultural Resources Management Plan, Marine Corps Base Hawaii 2006–2010* (USACE 2006). Numerous archaeological investigations have been undertaken at MCB Hawaii Kaneohe Bay. Table 3-13 lists 36 archaeological projects carried out in or adjacent to APEs. Locations of the archaeological project areas, keyed to the table, are shown in Figure 3-12.

Table 3-13. Previous Archaeological Investigations, Organized by Proposed Projects

Key to Figure 3-11	Proposed Project	Author	Date	Type of Work	Findings for Specific EIS Locations
1	MAG-24 HQ	Dega	1998	monitoring	Underground storage tank (UST) removal— no archaeological findings
		Jimenez et al.	1998	monitoring	Along First Street—no archaeological findings
`		Rosendahl	1999	monitoring	First Street, west of B Street— no cultural findings in APE, but some evidence of wetlands
		Asbury-Smith and Dega	2002	monitoring	UST 27, 28 removal— no archaeological findings
		Roberts et al.	2002	monitoring	Along First Street—isolated human remains in sand fill at two locations
2	VMM Alternative A	Cleghorn et al.	1994	inventory survey	Family Housing warehouse—no archaeological findings
		Schilz and Allen	1996	monitoring data recovery	Site 4933; secondary human remains
		Drolet et al.	1996	Inventory survey	MCCS self-storage area at southern base of Pali Kilo—concrete foundations of 20th c. homes, and WWII bunkers
		Anderson	1997	data recovery	Between runway and Pu‘u Hawai‘iloa, north of Mokapu Road—no archaeological findings in APE
		Wolforth and Rechtman	1997	test excavation	Family Housing warehouse—WWII era post foundations (Site 5477), concrete drainage canal (Site 5478); neither evaluated eligible to NRHP; no subsurface cultural deposits
		Williams and Patolo	1998	remote sensing	North end of runway—no archaeological findings
		Rosendahl	1999	monitoring	Along Mokapu Road across runway—no cultural materials; fill over terrigenous deposits
		Lawrence and Spear	2000	monitoring	UST KB29 removal—no cultural materials
		Prishmont and Anderson	2000	test excavation	North end of runway—no archaeological findings within APE
		Dixon et al.	2002	test excavation monitoring	Testing at lamp post locations between Hangar 104 and Sixth Street, west of B Street—cultural material just west of Site 5829; no cultural materials between Sites 4933 and 5829
		Roberts et al.	2002	monitoring	Family Housing warehouse (near intersection of Mokapu Road and D Street)—skeletal material in sand fill

Table 3-13. Previous Archaeological Investigations, Organized by Proposed Projects

Key to Figure 3-11	Proposed Project	Author	Date	Type of Work	Findings for Specific EIS Locations
		Rasmussen	2007a	screening monitoring	MACS II compound—monitoring demolition of Bldg 1363; two human bone fragments in demolition pit backfill
		McIntosh and Cleghorn	2010	monitoring data recovery	Puʻu Hawaiʻiloa—no intact archaeological deposits but isolated human remains in sand fill under house pads
		Morrison et al.	2010	remote sensing test excavation	MACS II compound—no intact burials or cultural deposits; human remains in disturbed context
		Cochrane	2011	test excavation	Area between runway and Puʻu Hawaiʻiloa—no cultural material
3	VMM Alternative B	Drolet et al.	1996	inventory survey	Area at southern base of Pali Kilo—concrete foundations of 20th c. homes, and WWII bunker
		Rosendahl	1999	monitoring	Across runway south of Mokapu Road—landfill; no cultural material
		Roberts et al.	2002	monitoring	No cultural materials
		O'Day	2007	inventory survey	No sites within APE
		Lauer	2008	monitoring	Bldg. 605—all fill; no archaeological findings within APE; fill is well inland of 1902 coastline
4	BEQ	Jimenez et al.	1998	monitoring	Trench just east of Building 230—no archaeological findings in APE
		Asbury-Smith and Dega	2002	monitoring	UST 256 removal—no cultural materials
		Roberts et al.	2002	monitoring	Along Third Street—no cultural materials
		Wulzen and Haun	1996	monitoring	South of Third Street—no cultural materials
5	MALS Maintenance	Allen and Schilz	1996	test excavation	Building 1178—no archaeological findings within APE; stratification indicates infilling of former inlet to create wetland; wetland may have been a resource area for nearby Site 4933
		Kaschko	1996	monitoring	West of B Street
		Allen and Schilz	1997b	monitoring	Building 1178—buried gleyed organic deposit (probable wetlands)
		Jimenez et al.	1998	monitoring	Along Second and B Streets—no archaeological deposit; human remains in sand fill
		Rosendahl	1999	monitoring	Along Third Street, east of B Street; no cultural materials; fill over marine deposits

Table 3-13. Previous Archaeological Investigations, Organized by Proposed Projects

Key to Figure 3-11	Proposed Project	Author	Date	Type of Work	Findings for Specific EIS Locations
		Rechtman and Wolforth	2000	data recovery	Near Bldg 1178—19 backhoe trenches, areal excavation in Site 4933; four subsurface features, midden, artifacts, human remains
		Asbury-Smith and Dega	2002	monitoring	UST 16 removal—no cultural materials
		Roberts et al.	2002	monitoring	Along B Street, at intersection with Third Street
6	HMLA	Dega	1998	monitoring	East of MAG-24 HQ and north of HMLA
		Jimenez et al.	1998	monitoring	Aid Station (along Second Street)—no cultural materials
		Prishmont et al.	2001	monitoring	Along First Street—no cultural materials; gleyed soil indicates shallow off-shore deposits, tidal fluctuations, and development of wetlands
		Roberts et al.	2002	monitoring	Along First Street—no cultural materials
LZ	101 Helipad	McIntosh et al.	1996	monitoring	No cultural material
LZ	Boondocker	Denham et al.	1995	monitoring test excavation	No cultural material
		Schilz and Dies	1996	inventory survey	No cultural material
		Dega	1998	monitoring	No cultural material
LZ	Eagle	Dye	1976	test excavation	Fort Hase Beach (Site 2886)
		Allen and Schilz	1997a	monitoring	Fort Hase Beach (Site 2886); remnant traditional cultural layers with artifacts, charcoal, buried features
		Clark et al.	2004	monitoring test excavation	Fort Hase Beach (Site 2886); cultural materials occur in APE.
LZ	Rifle Range	Drolet et al.	1996	monitoring	Southern and central gullies in crater were used for dumping during and after WWII; interior of crater highly modified

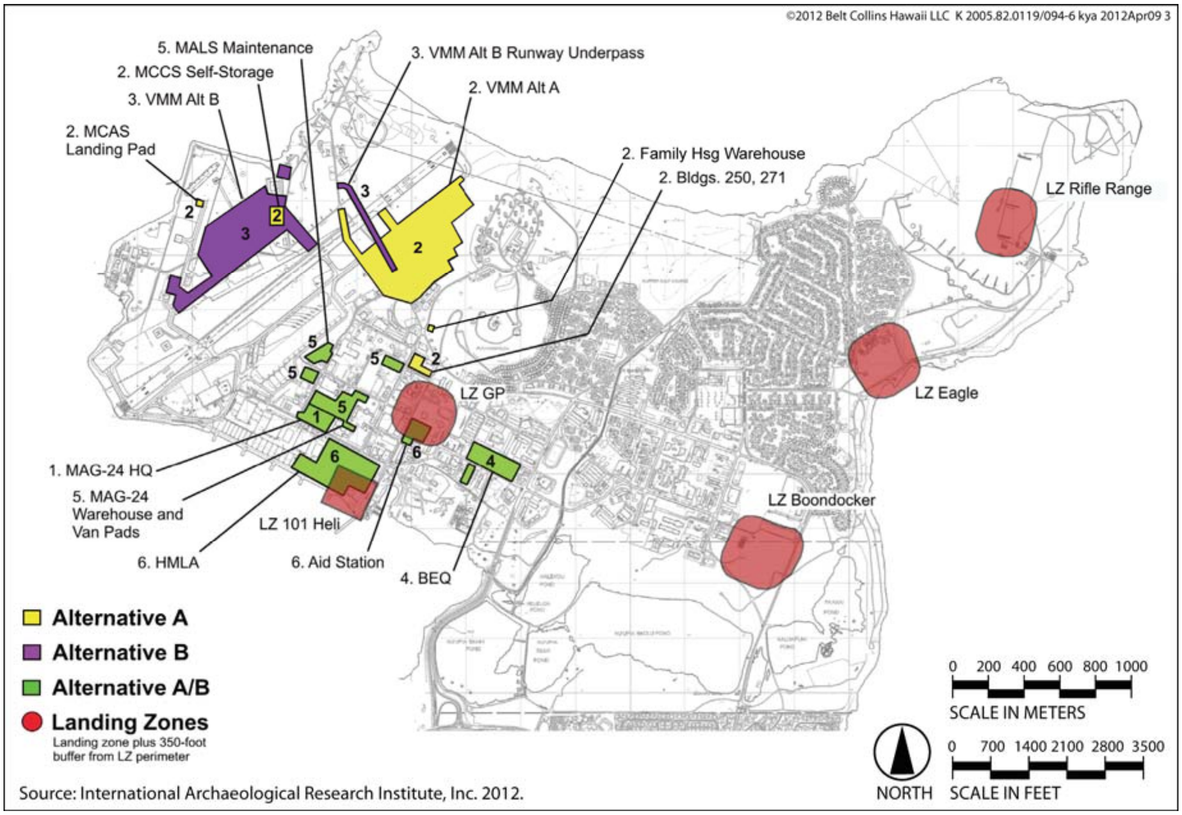

Figure 3-11. Area of Potential Effect (APE), MCB Hawaii Kaneohe Bay

Table 3-14 lists known archaeological sites within the MCB Hawaii Kaneohe Bay APEs. Narrative descriptions of the archaeological sites are presented in Appendix G-2.

Table 3-14. Archaeological Sites within the MCB Hawaii Kaneohe Bay APE

Site No. *	Description	Period	Proposed Project (Location)	Reference
2884	Concrete building foundations; probable small houses or storage facilities	WWII	VMM Alternative B (east edge)	Tuggle and Hommon 1986, Drolet et al. 1996
2886	Cultural deposit; intact burials	traditional; 19th century	LZ Eagle (buffer only)	Dye 1976, Allen and Schilz 1997a, Clark et al. 2004
4612	House ruins—part of Mokapu House Lots	early 20th century	VMM Alternative B (east edge)	Drolet et al. 1996

Table 3-14. Archaeological Sites within the MCB Hawaii Kaneohe Bay APE

Site No. *	Description	Period	Proposed Project (Location)	Reference
4613	Concrete walkway, unmortared stone wall—part of Mokapu House Lots	early 20th century; possible traditional	VMM Alternative B (east edge)	Drolet et al. 1996
4614	House ruins—part of Mokapu House Lots	early 20th century	VMM Alternative B (east edge)	Drolet et al. 1996
4615	Underground storage facility	WWII	VMM Alternative B (east edge)	Drolet et al. 1996
4624	Enclosure of stacked stone; cement block, glass, clay brick debris	early 20th century	VMM Alternative B (east edge)	Drolet et al. 1996; O'Day 2007
4933	Cultural deposit and intact burial; situated on former sand berm between two wetlands	traditional	MALS Maintenance (MALS-24 armory, composite shop; MAG-24 warehouse)	Allen and Schilz 1996, Rechtman and Wolforth 2000, Prishmont et al. 2001, Dixon et al. 2002, Gosser et al. 2002

Notes

* State of Hawaii site number, with prefix "50-80-11-" (50=State of Hawaii, 80=island of Oahu, 15=USGS Mokapu topographic quadrangle).

Major landscape modification occurred during the flurry of initial base construction. Former wetlands and shorelines were graded and filled, and dredging operations filled nearshore portions of the bay, thus expanding the useable land mass. Much of the area occupied by Hangars 101, 102, and 103, most of B Street, and the area west of Pali Kilo Road did not exist prior to World War II.

Buried archaeological deposits and human remains have been encountered in sites along the southwest coast (Sites 4453, 4933, and 5829) and on the east coast (Site 2886). These sites represent the remnants of pre-contact and 19th century occupation. On the west side of the peninsula, sites are located in a coastal marshland setting. On the north side of the peninsula, surface remnants of historic period habitation complexes have been preserved.

Site 1017, the Mokapu Burial Area, is located in the northern dunes of Mokapu Peninsula. Before base construction began in the years prior to World War II, archaeologists from the Bishop Museum and University of Hawaii recovered a large number of human remains from the site. Site 1017 was listed in the NRHP in 1974, and it remains a protected area. (See Appendix G-2 for background and descriptions.)

Surface archaeological structures occur on the slopes of Pali Kilo (Sites 2884, 4612-4615, 4623, 4624) and Puu Hawaiiloa (Site 1433), and in the vicinity of Reed Road near the base of Puu Hawaiiloa (Sites 5477, 5478). Except for Site 1433, which is a pre-Contact or early historic period complex, the surface structures date to 20th century residential and military activities.

Based on the distribution of known archaeological sites and analysis of the history of landscape change, areas on the peninsula where there is a high probability of archaeological site preservation can be delineated:

- along the pre-military coastline on the west side of the peninsula (see Figure 3-9);
- the southwest side and central portion of the peninsula where former wetlands/marshes existed (see Figure 3-9);
- the Pali Kilo/Keawanui area and coastline, which is the location of early 20th century homes (i.e., beach cottage foundations, as well as areas between the cottages that were used as outdoor spaces and path connections between homes);
- the northern Pali Kilo shoreline where pre-Contact cultural deposits have been identified among the historic homes (this is the only area on the peninsula where evidence of three distinct periods of chronological use exists); and
- the eastern coastline of Mokapu Peninsula where there has been much archaeological evidence of pre- and post-Contact habitation and use.

An added factor in evaluating the likelihood for buried cultural resources on the base is the potential for encountering human remains, even in areas that have seen intensive development. This is due to the former practice of using mined sand from the dunes for construction fill material, which occurred during World War II and continued through the 1960s. As a result, disturbed human remains in redeposited sand have been identified in older utility trenches and under building and road foundations at various locations throughout the peninsula. Thus, while it is highly unlikely that intact burials or cultural deposits in primary context exist in developed areas, there is a possibility of encountering fragmentary human remains in secondary contexts. Such remains would be treated as NAGPRA cultural items in accordance with the NAGPRA implementing regulations at 43 CFR Part 10.

3.9.2.3 Traditional Cultural Resources

All archaeological sites, including burial areas, are potentially important to Native Hawaiian organizations and individuals and may qualify for NRHP eligibility. Other types of cultural resources include places or resources (e.g., native plants) that may not meet criteria for NRHP eligibility but retain cultural importance. Formal studies have been conducted to identify traditional cultural properties at MCB Hawaii Kaneohe Bay (e.g., PHRI 1995 for Puu Hawaiiloa). Several studies regarding Hawaiian cultural significance of the peninsula identify areas or places that may be significant to Native Hawaiians (e.g., particularly, Seto 1999 for the peninsula). Except for Puu Hawaiiloa, no potential TCPs have been identified at MCB Hawaii Kaneohe Bay. The following traditional cultural resources (based on Tuggle and Hommon 1986 and PHRI 1995) are described in Appendix G-2: the Ili of Mokapu, Puu Hawaiiloa, Lu-o-Wai-o-Kanaloa, Ulupau Crater, Mokapu Cove Fishery and Salt Works, and Pali Kilo Multiple Resource Complex.

3.9.2.4 Historic Buildings

MCB Hawaii has conducted historic building surveys and evaluated buildings and structures for NRHP eligibility. One inventory report covered facilities constructed from the beginning of military activities on the peninsula up to 1952, with the historic context primarily being World War II, and another report covered facilities in relation to the Cold War (1945–1991). In addition, an aircraft hardstand was surveyed for damage from the December 7th attack. Findings of these surveys are summarized below.

Building Inventory: World War II Era Buildings Aboard MCB Hawaii Kaneohe Bay

The *Historic Building Inventory: World War II Era Buildings Aboard Marine Corps Base Hawaii, Kaneohe Bay (2011)* evaluated facilities built before 1952 when NAS Kaneohe occupied the west side of Mokapu Peninsula and Fort Hase occupied the east side of the peninsula. MCB Hawaii determined that 197 facilities are eligible for or listed in the NRHP. These facilities, all constructed before or during World War II, are eligible under Criterion A for their association with the war and the December 7th Japanese attack. One facility was found to be eligible under Criterion B (as well as A) for its association with President Dwight D. Eisenhower. Several structures were also determined to be eligible under Criterion C for their unique, World War II military construction types. The majority of the existing World War II facilities are located in the area that was NAS Kaneohe Bay, with only two facilities located in the area that was Fort Hase.

Six facilities and a parking apron listed in the inventory were designated as a National Historic Landmark (NHL) on May 28, 1987. The NHL includes Facilities 1 through 5 (seaplane ramps), Facility 101 (Hangar 1), the seaplane parking area to the east of Hangar 1, and the seaplane parking area between the hangars and Kaneohe Bay. All of these facilities are extant.

The base has three Historic Districts which contain World War II historic facilities: the Aviation District, the Administration District, and the Historic Officers' Housing District. The Aviation District generally includes the runway, the hangars, and their support buildings. The Administration District includes facilities initially built as administration, recreation, and enlisted bachelor housing to support the aviation mission of NAS Kaneohe, all of which surround the parade grounds, Dewey Square. The Historic Officers' Housing District includes facilities built as the initial officers' bachelor and family housing.

Several World War II significant properties are within the APE of the proposed action. See Appendix G-1 for more detailed descriptions of these historic properties.

Building Inventory: Cold War Era Buildings Aboard MCB Hawaii Kaneohe Bay

Surveys and archival research were conducted for the *Historic Context and Building Inventory Marine Corps Base Hawaii*, draft, dated February 2010. This report documented Cold War missions associated with MCB Hawaii Kaneohe Bay.

Two buildings were found to retain sufficient integrity to be considered eligible for the NRHP under Criterion A: Building 1181, a Missile Impact Location System Building, and Building 1182, a Generator/Transformer Building which supports Building 1181. An Engine Test Cell (Building 1178) constructed in 1960 is also present; however, a 1984 renovation of the building significantly altered it to the extent that it is not considered to have sufficient integrity to be eligible for the NRHP. No other facilities surveyed were found to have any association with a significant event or person (Criteria A and B).

Building 1086, Battalion Headquarters, was found to be eligible for the NRHP under Criterion C. Constructed in 1953, it embodies the distinctive characteristics of the 1950s period of architecture in Hawaii. No other facilities were considered sufficiently distinctive to be eligible for the NRHP.

None of the three NRHP-eligible Cold War facilities are within the APE of the proposed action.

Inventory of December 7th Attack Damage on Aircraft Hardstand

The aircraft hardstand surrounding Hangars 1 through 4 has been visually examined for apparent damage from the December 7th attack. The majority of this area is within the boundary of the NHL. Evidence of the attack remains in two repaired bomb craters and eleven areas of spalled concrete damage (some with repairs). One bomb crater is within the APE. In addition, remains of a compass rose are visible, including the center point and remnant ghost lines. No other identified possible attack damage is found in the APE. The report of this survey is included in Appendix G-1.

3.9.3 ENVIRONMENTAL CONSEQUENCES

This section describes potential impacts on archaeological resources, traditional cultural resources, and historic buildings under Alternative A, Alternative B, and the No Action Alternative.

Assessments of potential for archaeological resources to be located in the APEs are based on areas of cultural resource sensitivity presented in the *MCB Hawaii Integrated Cultural Resources Management Plan* (USACE 2006:3-14, 3-15, figure B-1), review of a considerable body of reports detailing archaeological investigations on Mokapu Peninsula, and management input from MCB Hawaii cultural resources staff. The assessment focuses on projects or activities that involve ground disturbance within the APEs.

Effects on traditional cultural resources are determined by the significance of the site within the APE, for example, whether it is a NRHP-eligible or listed TCP, or in the case of sites not defined as historic properties, whether they would be considered significant under other applicable federal statutes, EOs, or regulations.

The analysis of potential impacts on historic buildings focuses on those buildings within the APE proposed for demolition, renovation, or other modifications.

Alternative A

Table 3-15 summarizes the proposed construction projects under Alternative A with regard to effects on archaeological resources. All construction projects have the potential to encounter disturbed human remains in secondary contexts.

Under Alternative A*,* VMM facilities would occupy the area between the northern half of the runway and Reed Road. A large portion of the area was surveyed and tested as part of the EIS preparation (Cochrane 2011b). No cultural materials were found in test excavations.

In addition to the development of hangars and apron, the VMM project under Alternative A would include a Marine Corps Community Services (MCCS) self-storage building and MCAS helipad on the west side of the runway in the West Field area. The self-storage facility would fall at the edge of the Mokapu House Lots historic district. The helipad is situated on land created by World War II dredging and fill (see Figure 3-9).

The APE for the proposed Marine Aviation Logistics Squadron 24 (MALS-24) composite shop, warehouse, and armory is located in an area adjacent to a subsurface archaeological deposit (Site 4933). The horizontal extent of the site is not known; therefore, there is potential to encounter cultural deposits within the MALS-24 APE.

The remaining construction projects listed in Table 3-15 are in highly developed areas with no known sites, and the probability of encountering subsurface sites is unlikely.

Table 3-15. Alternative A – Effects of Proposed Construction Projects on Archaeological Resources

Proposed Projects	Key to Figure 3-11	Arch Site	Archaeological Potential	Actions that Could Affect Archaeological Resources
MAG-24 HQ	1	none	none—area of historic fill	▪ Ground disturbance, particularly utility trench excavations
VMM (hangars and apron)	2	none	low—most of APE is in area of graded runway	▪ Site preparation at all new facilities, including at locations for temporary buildings (excavation/grading, clearing and grubbing, site cleanup) ▪ Installation of underground electric, water, and sewer lines, fire suppression systems ▪ Installation of off-site connector utility lines ▪ Ground disturbance related to building demolition
VMM (Family Housing warehouse)	2	none	low—area of intensive development	▪ Ground disturbance, particularly utility trench excavations
VMM (MCCS self-storage)	2	Mōkapu House Lots	high—at edge of National Register district	▪ Site preparation at all new facilities, including at locations for temporary buildings (excavation/grading, clearing and grubbing, site cleanup) ▪ Installation of underground utility lines
VMM (MCAS helipad)	2	none	none-area of historic fill	▪ Ground disturbance, particularly utility trench excavations
BEQs	4	none	low—area of intensive development	▪ Use of structural fill beneath concrete slab foundation of proposed structures; concrete piles as part of structural foundation ▪ Ground disturbance, particularly utility trench excavations

Table 3-15. Alternative A – Effects of Proposed Construction Projects on Archaeological Resources

Proposed Projects	Key to Figure 3-11	Arch Site	Archaeological Potential	Actions that Could Affect Archaeological Resources
MALS-24 Maintenance (composite shop, warehouse, and armory)	5	4933	high—area is identified as possible former wetland related to Site 4933	▪ Site preparation at all new facilities (excavation/grading, clearing and grubbing, site cleanup) ▪ Ground disturbance related to building demolition ▪ Installation of underground electric, water, and sewer lines, fire suppression systems
MAG-24 (warehouse, ground support equipment, and van pads)	5	none	none—area of historic fill	▪ Ground disturbance, particularly installation of underground electric, water, and sewer lines, fire suppression systems
MALS-24 Maintenance (supply warehouse)	5	none	low—area of intensive development	▪ Ground disturbance, particularly utility trench excavations
HMLA Hangar 101	6	none	none—area of historic fill	▪ Installation of new utility lines (sewer, water, electrical, mechanical) and storm water drainage system at Hangar 101 and adjacent parking apron (including north side of First Street); installation of new AFFF underground collection and holding system (west of Hangar 101) ▪ Installation of two additional electrical feeders from main HECO substation to MCB Hawaii Switch Station #3 (off-site)
HMLA Aid Station	6	none	none—area of historic fill	none

Table 3-16 summarizes aviation operations and facilities associated with the proposed action at MCB Hawaii Kaneohe Bay. These involve five landing zones proposed for use by the squadrons under both Alternatives A and B. No construction is proposed at the LZs.

Four of the five LZs are in areas where no archaeological sites have been identified and with little potential for sites occurring. LZ 101 Helipad, which is located within the National Historic Landmark, contains no known archaeological sites, although a bomb crater from the December 7th Japanese attack is within the LZ APE (see Appendix G-1). A small portion of the southwestern boundary of the LZ Boondocker APE falls at the northern edge of the Mokapu Peninsula Fishpond Complex (Site 1002). Archaeological investigations within the APE encountered no cultural deposits (Denham et al. 1995; Schilz and Dies 1996; Dega 1998).

Table 3-16. Alternatives A and B - Effects of Proposed Aviation Operations on Archaeological Resources

LZ	Key to Figure 3-11	Arch Site	Archaeological Potential	Actions that Could Affect Archaeological Resources
101 Helipad	--	none	none—area of historic fill	▪ None—no construction proposed
Eagle	--	2886	none—area of intensive development	▪ None—no construction proposed; no downwash impacts
Boondocker	--	none	low—area of intensive development	▪ None—no construction proposed
Rifle Range	--	none	low—area of intensive development	▪ None—no construction proposed
GP 216	--	none	low—area of intensive development	▪ None—no construction proposed

A portion of LZ Eagle encompasses a part of Site 2886. LZ Eagle is located near the northern end of Fort Hase Beach on the eastern shore of the peninsula. The Fort Hase Beach Site (Site 2886) is located within the LZ APE, which includes a buffer. Rotor downwash from the MV-22 is not anticipated to be a problem since the site consists of a subsurface deposit that would be protected from rotor downwash by its location in an east-facing bank (away from the LZ).

LZ Rifle Range in the interior of Ulupau Crater and LZ GP 216 in the highly developed administrative area are located in areas where no archaeological sites have been identified (PHRI 1995 and USACE 2006).

Two traditional cultural resources (based on Tuggle and Hommon 1986 and PHRI 1995) are located in the vicinity of proposed construction projects: the Ili of Mokapu and the Mokapu Cove Fishery and Salt Works. The Ili of Mokapu is near the proposed VMM hangars and apron. Mokapu Cove is near the MALS composite shop, warehouse, armory, and supply warehouse, as well as the MAG-24 warehouse, ground support equipment, and van pads.

Table 3-17 lists the NRHP-eligible facilities affected by the proposed demolition/construction projects under Alternative A. See Figure 3-8 for the location of these NRHP-eligible facilities, and refer to Appendix G-1 for more detailed descriptions. The Aviation District and the Administration District would be adversely affected by demolition of contributing historic buildings.

The NHL, which includes Hangar 1 (Building 101), the seaplane ramps, and the aircraft parking apron, would also be adversely affected under both Alternatives A and B.

The most prominent historic facilities affected by Alternative A include an administration building (Building 301) and six BEQs (Buildings 225 through 230). If Alternative A is implemented, six of eleven NRHP-eligible World War II-era BEQs would be demolished. Under this alternative, the proposed action is to construct three new four-story BEQ buildings to provide required living space; however, the final design of the replacement BEQs (number, configuration, and building height/square footage) will be determined by a design review process outlined in the PA.

Table 3-17. Alternative A – Effects of Proposed Construction Projects on NRHP-Eligible Facilities

Bldg No.	Historic Facility Name	Year Built	Description of Proposed Work Related to Historic Facility
101	Hangar 1 (HMLA Hangar 101)	1941	Renovate following Secretary of the Interiors Standards
167	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar 101 to meet AT/FP guidelines.
168	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar101 to meet AT/FP guidelines.
170	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar 101 to meet AT/FP guidelines.
194	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar 101 to meet AT/FP guidelines.
195	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar 101 to meet AT/FP guidelines.
196	Aircraft Spares Storage (HMLA Hangar 101)	1943	Connect facility to Hangar 101 to meet AT/FP guidelines.
225	Bachelor Enlisted Quarters	1940–41	Demolish
226	Bachelor Enlisted Quarters	1940–41	Demolish
227	Bachelor Enlisted Quarters	1940–41	Demolish
228	Bachelor Enlisted Quarters	1940–41	Demolish
229	Bachelor Enlisted Quarters	1940–41	Demolish
230	Bachelor Enlisted Quarters	1940–41	Demolish
250	Warehouse (VMM Facilities)	1942–43	Renovate; primarily involving non-permanent interior features.

Table 3-17. Alternative A – Effects of Proposed Construction Projects on NRHP-Eligible Facilities

Bldg No.	Historic Facility Name	Year Built	Description of Proposed Work Related to Historic Facility
271	Warehouse/SASSY Warehousing (VMM Facilities)	1944	Renovate; primarily involving non-permanent interior features. Restroom addition.
301	Squadron Offices & Storage Building (MAG-24 HQ)	1941	Demolish

Notes:
ATFP = Anti-Terrorism/Force Protection

Alternative B

Table 3-18 summarizes the proposed construction projects under Alternative B, with regard to effects on archaeological resources. All construction projects have the potential to encounter disturbed human remains in secondary contexts.

Under Alternative B, the VMM facilities would be developed on the west side of the runway (West Field) and a runway underpass would be constructed. The eastern edge of the Alternative B VMM project falls within the area of the Mokapu House Lots complex, a National Historic District which consists of the remains of early 20th century residential development on the peninsula (see also the discussion of Pali Kilo in Appendix G-2 as a possible traditional cultural property). The southern edge of the project area was the pre-World War II shoreline, which Webster's 1851 map shows as the location of three houses near the southern base of Pali Kilo (this would be roughly the present intersection of Sumner and Pali Kilo Roads); buried cultural deposits may be encountered in this area.

Other than VMM facilities, the Alternatives A and B construction projects that affect archaeological resources are the same, and Table 3-17 repeats the effects of these projects as they are listed in Table 3-18.

Table 3-18. Alternative B – Effects of Proposed Construction Projects on Archaeological Resources

Proposed Project	Key to Figure 3-11	Archaeological Site	Archaeological Potential	Actions that Could Affect Archaeological Resources
MAG-24 HQ	1	none	none—area of historic fill	▪ Ground disturbance, particularly utility trench excavations ▪ Impact on possible cultural site to be determined

Table 3-18. Alternative B – Effects of Proposed Construction Projects on Archaeological Resources

Proposed Project	Key to Figure 3-11	Archaeological Site	Archaeological Potential	Actions that Could Affect Archaeological Resources
VMM Alt B (hangars, apron, and runway underpass)	3	Mōkapu House Lots	none—most of APE is in area of historic fill or disturbance high—east edge (Mokapu House Lots) and south edge (location of mid-19th century houses)	▪ Ground disturbance, particularly utility trench excavations and building demolition ▪ Installation of off-site connector utility lines
BEQs	4	none	low—area of intensive development	▪ Use of structural fill beneath concrete slab foundation of proposed structures; concrete piles as part of structural foundation ▪ Ground disturbance, particularly utility trench excavations
MALS Maintenance (composite shop, warehouse, and armory)	5	4933	high—area is identified as possible former wetland related to Site 4933	▪ Site preparation at all new facilities (excavation/grading, clearing and grubbing, site cleanup) ▪ Ground disturbance related to building demolition ▪ Installation of underground electric, water, and sewer lines, fire suppression systems
MALS Maintenance (warehouse, ground support equipment, and van pads)	5	none	none—area of historic fill	▪ Ground disturbance, particularly installation of underground electric, water, and sewer lines, fire suppression systems
MALS Maintenance (supply warehouse)	5	none	low—area of intensive development	▪ Ground disturbance, particularly utility trench excavations
HMLA Hangar 101	6	none	none—area of historic fill	▪ Installation of new utility lines (sewer, water, electrical, mechanical) and storm water drainage system at Hangar 101 and adjacent parking apron (including north side of First Street); installation of new AFFF underground collection and holding system (west of Hangar 101) ▪ Installation of two additional electrical feeders from main HECO substation to MCB Hawaii Switch Station #3 (off-site)
HMLA Aid Station	6	none	none—area of historic fill	None

Impacts on archaeological resources due to aviation operations at the five landing zones described above for Alternative A would be the same for Alternative B (LZs 101 Helipad, Eagle, Boondocker, Rifle Range, and GP 216).

One traditional cultural resource, the Mokapu Cove fisher and Salt Works, is located in proximity to proposed Alternative B construction projects. It is in the vicinity of the MALS and MAG-24 projects.

Table 3-19 lists the NRHP-eligible facilities affected by the proposed demolition/construction projects under Alternative B. See Figure 3-7 for the location of these NRHP-eligible facilities, and refer to Appendix G-1 for more detailed descriptions.

Table 3-19. Alternative B - Effects of Proposed Construction Projects on NRHP-Eligible Facilities

Bldg No.	Historic Facility Name	Year Built	Description of Proposed Work Related to Historic Facility
101	Hangar 1 (HMLA Hangar 101)	1941	Renovate following Secretary of the Interiors Standards
167	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar 101 to meet AT/FP guidelines.
168	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar101 to meet AT/FP guidelines.
170	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar 101 to meet AT/FP guidelines.
194	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar 101 to meet AT/FP guidelines.
195	Aircraft Spares Storage (HMLA Hangar 101)	1942	Connect facility to Hangar 101 to meet AT/FP guidelines.
196	Aircraft Spares Storage (HMLA Hangar 101)	1943	Connect facility to Hangar 101 to meet AT/FP guidelines.
227	Bachelor Enlisted Quarters	1940–42	Demolish
228	Bachelor Enlisted Quarters	1940–42	Demolish
229	Bachelor Enlisted Quarters	1940–42	Demolish
230	Bachelor Enlisted Quarters	1940–42	Demolish
250	Warehouse (VMM Facilities)	1942–43	Renovate; primarily involving non-permanent interior features.
271	Warehouse/SASSY Warehousing (VMM Facilities)	1944	Renovate; primarily involving non-permanent interior features. Restroom addition.

Table 3-19. Alternative B - Effects of Proposed Construction Projects on NRHP-Eligible Facilities

Bldg No.	Historic Facility Name	Year Built	Description of Proposed Work Related to Historic Facility
601	Warehouse (VMM Facilities)	1941	Demolish
602	Warehouse (VMM Facilities	1941	Demolish
603	Warehouse (VMM Facilities)	1941	Demolish
605	Warehouse (VMM Facilities)	1941	Demolish
995	Flammables Storehouse (VMM Facilities)	1942	Demolish
14	Revetment (VMM Facilities)	1942	Demolish
15	Revetment (VMM Facilities)	1942	Demolish
17	Revetment (VMM Facilities)	1942	Demolish
612	Torpedo Storage Building	1942	Demolish
620	Quonset Warehouse (VMM Facilities)	1945	Demolish
301	Squadron Offices & Storage Building (MAG-24 HQ)	1941	Demolish

ATFP = Anti-Terrorism/Force Protection

As with Alternative A, the Aviation District and the Administration District would be adversely affected by demolition of contributing historic buildings.

The NHL, which includes Hangar 1 (Building 101), the seaplane ramps, and the aircraft parking apron, would also be adversely affected under Alternative B.

If Alternative B is implemented, four of the BEQ buildings would be demolished (Buildings 227, 228, 229, and 230) instead of six; two would be retained (Buildings 225 and 226). Specific renovation and reuse of the retained buildings would be determined at a future time; such actions would be evaluated in a separate NEPA document at the appropriate time. Under this alternative, the proposed action is to construct two new six-story BEQ buildings to provide required living space; however, the final design of the replacement BEQs (number, configuration, and building height/square footage) will be determined by a design review process outlined in the PA.

With Alternative B, construction of MV-22 facilities at West Field would require demolition of ten historic structures that would not be demolished under Alternative A. Facilities 14, 15, 17, 601, 602, 612, 620, and 995, listed in Table 3-19, were all constructed during World War II as part of NAS Kaneohe Bay. More information about these buildings is presented in Appendix G-1.

No Action Alternative

The No Action Alternative would result in no effects to archaeological resources, traditional cultural resources, or historic buildings.

Proposed Mitigation

There is a potential for adverse effects on archaeological site 4933 and the Mokapu House Lots complex (a National Historic District) resulting from the MALS maintenance project under both Alternatives A and B; the MCCS self-storage facility under Alternative A; and VMM facilities under Alternative B (east edge). The proposed mitigation would be to avoid the sites if possible. If avoidance is not feasible, the Marine Corps would follow procedures specified in the PA developed as part of the Section 106 NHPA process.

Because of the potential for the occurrence of disturbed human remains in secondary contexts (sand fill), mitigation may include monitoring of ground-disturbing activities in areas where dune sand is encountered.

The Marine Corps has made a determination that there would be an adverse effect on historic buildings. Mitigation measures for the effects of the proposed undertaking are being documented in the PA.

Summary

Cultural resources include archaeological, historic, and traditional cultural properties. No traditional cultural properties would be affected under the proposed action (Alternatives A and B) or the No Action Alternative, and there would be no significant impact on archaeological or historic properties under all alternatives with respect to the NEPA. Impacts on archaeological and historic properties would be further minimized with the mitigation being identified under the NHPA Section 106 process.

The Marine Corps has made a determination under NHPA Section 106 that the proposed action or undertaking will have an adverse effect on historic properties at MCB Hawaii Kaneohe Bay.

There would be adverse effects on archaeological Site 4933 (Alternatives A and B) and the Mokapu House Lots complex (MCCS self-storage facility in Alternative A, and Alternative B VMM facilities) during construction. There is potential for encountering disturbed human remains in secondary contexts (sand fill) for all of the construction projects.

With two exceptions, all of the proposed construction of facilities to support the VMM and HMLA squadrons under Alternatives A and B would take place in areas of historic fill, in already graded areas, or in areas of intensive development. One exception is the MALS-24 composite shop, warehouse, and armory; the APE for this project is adjacent to a subsurface archaeological deposit (Site 4933). As the horizontal extent of this site is unknown, there is a potential to encounter cultural deposits within the MALS-24 APE.

The other exception is construction in the West Field area: the MCCS self-storage facility proposed in Alternative A and the VMM facilities and runway underpass proposed in Alternative B. Most of the APE of the West Field location for these facilities is in disturbed areas or areas of historic fill. However, the MCCS self-storage facility and the eastern edge of the Alternative B project falls within the area of the Mokapu House Lots complex, and the southern edge of the Alternative B APE was the pre-World War II shoreline and site of three mid-19th century houses. Buried cultural deposits may be encountered here.

For both Alternatives A and B, five LZs at MCB Hawaii Kaneohe Bay were evaluated for effects due to MV-22 rotor downwash. Four of the LZs are in areas where no archaeological sites have been identified and with little potential for sites occurring. A portion of the Fort Hase Beach Site (Site 2886) is located within the APE of LZ Eagle. Rotor downwash impacts are not likely since the site consists of subsurface deposits protected from rotor downwash by its location in an east-facing bank away from the LZ.

Both Alternatives A and B would have adverse effects on historic buildings and structures at MCB Hawaii Kaneohe Bay, including an adverse effect on the Kaneohe Naval Air Station NHL. With Alternative A, nine NRHP-eligible facilities are proposed for renovation and seven are proposed for demolition, including the demolition of six BEQs. With Alternative B, nine NRHP-eligible facilities are proposed for renovation and 15 are proposed for demolition, including the demolition of four BEQs.

Measures to mitigate impacts on historic properties are being documented in the PA developed as part of the NHPA Section 106 consultation process.

The No Action Alternative would result in no adverse impacts to archaeological resources, cultural sites, or historic buildings.

3.10 SAFETY AND ENVIRONMENTAL HEALTH

The following issues are addressed in this section:

- Natural hazards: flood, tsunami, and seismic hazards
- Hazardous materials and waste: Installation Restoration Program (IRP) sites, underground and aboveground storage tanks (USTs and ASTs)
- Aviation safety: airfield safety, aircraft safety, BASH, and wildland fires
- Ordnance safety

Figure 3-12 is a constraints map of MCB Hawaii Kaneohe Bay showing the location of flood and tsunami evacuation zones, IRP sites, accident potential zones (APZ) and imaginary surfaces, and explosive safety quantity distance (ESQD) arcs. In addition, this figure shows the location of proposed projects. Two locations are shown for the proposed MV-22 facilities, one southeast of the runway (Alternative A) and one northwest of the runway (Alternative B).

3.10.1 NATURAL HAZARDS

3.10.1.1 Introduction

This section addresses flood, tsunami, and seismic hazards at MCB Hawaii Kaneohe Bay as they relate to the proposed action. The ROI for natural hazards is the area of the base to be developed under Alternative A or B. With different development layouts, Alternatives A and B would have different flood and tsunami hazard impacts. No seismic hazard differences are anticipated between the alternatives.

3.10.1.2 Affected Environment

Flood Hazard

The Federal Emergency Management Agency (FEMA) identifies Special Flood Hazard Areas as those which are subject to inundation by a one percent annual chance flood (also known as the 100-year flood or base flood). Special Flood Hazard Areas are divided into zones. Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area. Figure 3-12 shows the Flood Hazard Areas for the project area at MCB Hawaii Kaneohe Bay.

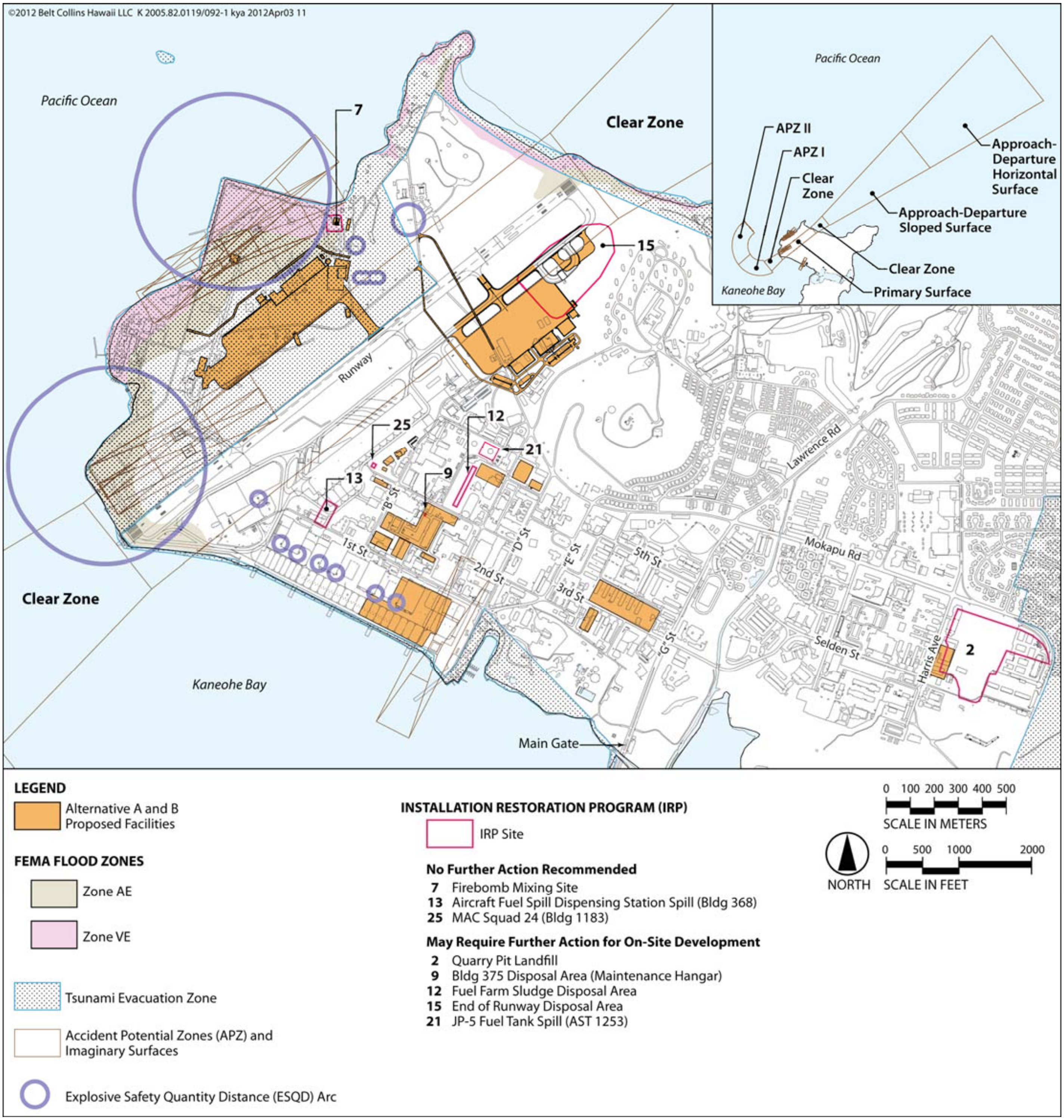

Figure 3-12. MCB Hawaii Natural and Man-Made Constraints

Tsunami Hazard

Tsunami evacuation zones on the island of Oahu are defined by the State Department of Civil Defense, City Department of Emergency Management, State DLNR, State Office of Planning GIS Program, and University of Hawaii Pacific Disaster Center. Evacuation zones and recommended actions are based on estimated inundation limits using available historic data. Figure 3-12 shows the tsunami evacuation zones for the project area at MCB Hawaii Kaneohe Bay.

Seismic Hazard

The island of Oahu is subject to earthquake activity. Earthquake loading data is provided in UFC 3-301-01, Structural Engineering with Change 2, dated January 31, 2011. The most recent earthquakes occurred offshore in 2010 and 2011. In 2010, the U.S. Geological Survey (USGS) reported a 3.6-magnitude earthquake in the Kaiwi Channel east of Oahu. The 2011 earthquake (4.0-magnitude) had an epicenter south of Oahu. According to USGS, the only other recent quakes near Oahu were in 2002 (3.9-magnitude) and 1980 (4.0-magnitude), both offshore (Star-Advertiser 2011).

3.10.1.3 Environmental Consequences

Flood Hazard

According to the Hawaii – National Flood Insurance Rate Program, FEMA, Alternative A improvements and most of Alternative B improvements would be located in Zone D, where flood hazards are undetermined but possible.

A small portion of Alternative B at West Field is located in Zone AE with a Coastal Base Flood Elevation of 7 ft (2.1 m). The 100-year floodplain is considered a high risk flood area and is associated with a flood that has a 1-percent-annual chance of being equaled or exceeded in any given year, i.e., the area has a one percent chance of flooding every year (FEMA 2011). Zone AE areas are where base flood elevations (elevations to which the water surface would rise during a flood) have been determined. Mitigation may be required for Alternative B to address the siting of facilities in Zone AE, in compliance with EO 11988, Floodplain Management.

With the No Action Alternative, there would be no facilities construction; no mitigation is required.

Tsunami Hazard

Facilities proposed in Alternative A would not be within the tsunami evacuation zone. At West Field, a portion of proposed Alternative B facilities would be within the tsunami evacuation zone. In case of a tsunami warning, personnel located at those facilities would follow natural disaster preparedness and evacuation procedures for the base. No construction would occur under the No Action Alternative. No mitigation is required for any of the alternatives.

Seismic Hazard

New facilities proposed in Alternatives A and B would be designed and constructed in accordance with site-specific geotechnical and structural engineering investigations and would comply with the seismic design criteria requirements provided in the IBC, UFC 1-200-01, General Building Requirements, UFC 3-301-01, Structural Engineering, and UFC 3-310-04, Seismic Design for Buildings. Impacts associated with seismically induced ground motion and ground shaking would be reduced with the implementation of the above measures. No seismic impacts would be associated with the No Action Alternative, which would not involve facilities construction.

Summary

Potential development-related impacts on flood, tsunami, and seismic hazards would vary with Alternatives A and B. At West Field, a portion of proposed Alternative B facilities would be within a high risk flood zone as determined by FEMA and within the tsunami evacuation zone. No differences are anticipated between the alternatives for seismic hazard. For both action alternatives, potential impacts would be minimized through compliance with applicable regulations and building codes. The No Action Alternative would have no additional impacts related to natural hazards.

3.10.2 HAZARDOUS MATERIALS AND WASTE

3.10.2.1 Introduction

This section addresses impacts associated with hazardous materials and hazardous waste. These substances have hazardous physical and chemical properties and/or high toxicity. They are called hazardous materials before and during their use, and they become hazardous wastes when they are no longer needed. Common materials and substances in this category are polychlorinated biphenyls (PCB), solvents, and pesticides. Other issues related to this topic are IRP sites, ASTs, and USTs.

The proposed action would involve the use and/or generation of hazardous materials and hazardous wastes in the short term during demolition and construction and in the long term during operations. At MCB Hawaii Kaneohe Bay, the ROI is the immediate area where the squadrons would operate and where construction is planned, as well as areas downstream that could potentially be affected in the event of a spill. Except for one difference due to siting of projects, no substantial differences in impacts are anticipated between Alternatives A and B given compliance with applicable regulations, plans, and SOPs.

3.10.2.2 Affected Environment

Hazardous Waste Management Plan

MCB Hawaii Kaneohe Bay has developed a Hazardous Waste Management Plan (HWMP) describing the responsibilities, requirements, and procedures for handling, accumulating, turning in, and removing hazardous waste (HW) and regulated non-HW generated on the base. The HWMP specifies procedures and protocols for waste management at the unit level and at the Base Hazardous Waste Accumulation Site (BHWAS). MCB Hawaii Kaneohe Bay neither stores nor transports any hazardous waste, and the base accumulates hazardous waste no longer than 90 days. Hazardous waste transportation and disposal are currently the responsibility of the Defense Reutilization and Marketing Office (DRMO) – Hawaii (NFESC 2004). Hazardous materials (new or in-use products) are properly stored in various locations at MCB Hawaii Kaneohe Bay, including storage tanks, flammable storage lockers, shelves, and materials storage warehouses. Excess hazardous materials are returned to the HAZMIN center, where they are screened for use by other units to prevent them from being wasted. Materials are used long before the expiration date.

Training is provided on how to follow and implement the plan. A two-day environmental awareness class is held quarterly, discussing spill reporting, response procedures, and hazardous materials and hazardous waste accumulation and disposal. See Section 2.6.1.6 for additional information on hazardous materials and waste management during operations.

Installation Restoration Program (IRP) Sites

In accordance with the IRP, an Initial Assessment Study (IAS) was completed in 1984 at MCB Hawaii Kaneohe Bay. Naval Energy and Environmental Support Activity (NEESA) performed the IAS to identify and assess potentially hazardous disposal sites and contaminated areas covered by past hazardous waste storage, handling, or disposal practices. The IAS identified 18 disposal and spill sites at MCB Hawaii Kaneohe Bay. No further action was recommended for ten of the sites, five of the sites required further action if on-site development was planned, two sites were recommended for further action, and one site was recommended for a confirmation study (NEESA/OESO 1984).

The IRP at MCB Hawaii Kaneohe Bay has been ongoing since the 1983 IAS. Based on the Environmental Cleanup Program Sites Status Update, July 2011, there are currently 22 IRP sites on MCB Hawaii Kaneohe Bay. Procedures are in place for any work needing to be done at these IRP sites. Figure 3-12 above shows the locations of the IRP sites located near the Alternative A and B proposed facilities.

IRP Site 9 (Building 375 Maintenance Hangar Disposal Area), IRP Site 12 (Fuel Farm Sludge Disposal area), and IRP Site 21 (JP-5 Fuel Tank Spill, AST 1253) are located near the proposed MALS Maintenance facility and may require further action. IRP Site 2 (former Quarry Pit Landfill) is located at the site of the proposed Building 4088 renovation and expansion; IRP Site 15 (end of runway disposal area) is located near the proposed MV-22 aircraft apron. Descriptions of these sites are provided below.

IRP Site 9 (Building 375 Maintenance Hangar Disposal Area). The Building 375 Maintenance Hangar disposal area consisted of a pit initially excavated to hold sewage overflow for a sewer line in 1976. The pit remained open for about six years and may have been used for solvent and waste oil disposal. According to the MCB Hawaii Environmental Restoration Program, soil samples collected in 2006 indicated that the site does not pose an environmental hazard. A document for the decision of no further action is currently being prepared.

IRP Site 12 (Fuel Farm Sludge Disposal Area). The fuel farm sludge disposal area is an open grassy field located at the MCB Hawaii Fuel Farm. The former disposal area is approximately 550 ft (167.6 m) long and 60 ft (18.3 m) wide and located east of Buildings 349 and 370 and parallel to Fifth Street. To dispose of cleaning waste, a leaching field, consisting of three trenches and disposal pits, was excavated in the southern half of the site. Approximately 15,000 gallons (56,781 liters) of cleaning wastewater and 200 to 300 gallons (757 to 1,136 liters) of an algae sludge generated during the tank cleaning were disposed of in the trenches (AECOM and Chee 2011).

IRP Site 21 (JP-5 Fuel Tank Spill, AST 1253). AST 1253 is located at the MCB Hawaii Fuel Farm and immediately north of IRP Site 12 described above. In 1987, the Navy noticed a 3-inch (in) (7.6-centimeter [cm]) drop in the level of Jet Propellant Grade 5 (JP-5) in AST 1253. An investigation found that an estimated 60,000 gallons (227,125 liters) of JP-5 had leaked into the surrounding soil. The Navy repaired the tank and subsequently installed a lined secondary containment system around both AST 1252 and AST 1253. Findings from a site investigation in 1989, remedial investigations in 2003 and 2004, and a site characterization study in 2007 and 2008 indicated that the JP-5 plume from AST 1253 had migrated approximately 100 ft (30.5 m) to the southwest, 150 ft (45.7 m) to the west, and 50 ft (15.2 m) to the east (AECOM and Chee 2011).

IRP Site 2 (Quarry Pit Landfill). The Quarry Pit Landfill near the east end of the base was used in the 1940s through the 1960s as a quarry pit and for storage/disposal operations, and as a solid waste landfill for disposal of base debris between 1972 and 1976. Reports indicated that petroleum, oil and lubricants, solvents, paints, thinners, batteries, mercury, transformer oils, pentachlorophenol, and glass beads from paint stripping operations were disposed of at this landfill, as well as general refuse including cans, paper, plastic, wood, and unidentified organic debris. The landfill has a soil cover that has become fairly heavily vegetated except near its center, which has been kept clear of heavy overgrowth (Element 2011).

IRP Site 15 (End of Runway Disposal Area). According to the MCB Hawaii Environmental Restoration Program, the disposal area was filled to extend the runway in the mid 1940s. Soil samples collected in 2006 indicate that the site does not pose an environmental hazard. A document for no further action is currently being prepared.

USTs and ASTs

There are five active USTs and 77 ASTs at MCB Hawaii Kaneohe Bay. Two of the five active USTs are located near the airfield. One is a diesel tank for the emergency generator at the old control tower, and the other is an oil/water separator for used oil located at the fixed wing range facility. EPA has issued regulations requiring a Spill Prevention, Control, and Countermeasure (SPCC) Plan for non-transportation-related, oil product-storing facilities that could possibly discharge oil in harmful quantities to navigable waters of the U.S. MCB Hawaii Kaneohe Bay is subject to these requirements based on its aboveground storage tank oil capacity.

3.10.2.3 Environmental Consequences

Hazardous Materials and Waste

SOPs are in place for handling and management of hazardous materials and waste. BMPs would be implemented and enforced during construction and throughout operations. See Section 2.6.1.6 for more information. Impacts would be minimized, given compliance with applicable laws and regulations and the base's Hazardous Waste Management Plan. No mitigation is needed.

Under the No Action Alternative, no impacts are anticipated and no mitigation is needed.

IRP Sites

IRP Site 9 (Building 375 Maintenance Hangar Disposal Area). IRP Site 9 is located near the proposed MALS Maintenance facility, to be developed in both action alternatives. The site does not pose an environmental hazard and no further action is required.

IRP Site 12 (Fuel Farm Sludge Disposal Area). IRP Site 12 is located near the proposed MALS Maintenance facility, to be developed in both action alternatives. The site is undergoing a Remedial Investigation (RI) to evaluate the nature and extent of the threat to human health and the environment. The RI will also provide a basis to support the development, evaluation, and selection of appropriate response alternatives as warranted. As part of the RI, fieldwork will include sampling and testing of groundwater, soils, and soil gases. The intent of the RI is to perform all tasks, including groundwater, soil, and soil gas sampling fieldwork, necessary to obtain closure of IRP Site 12.

Soil gas sampling fieldwork for the RI is in progress. Soil gas samples will be obtained near the existing sludge leaching fields and at a proposed Fuel Building site, Mission Support Facility site, and Containerized Flight Training Device Support Pads site.

Because the proposed MALS Maintenance facility will be located directly north of the Containerized Flight Training Device Support Pads and east of the sludge leaching fields, additional fieldwork and evaluation of the site may be required for on-site development.

New facilities proposed in Alternatives A and B would be designed and constructed in accordance with appropriate SOPs and BMPs (see Section 2.6.1.6). Recommendations from the final RI report will also be addressed prior to and during construction of the MALS Maintenance facility. Impacts associated with IRP Site 12 would be reduced with implementation of the above measures.

No impacts would be associated with the No Action Alternative, which would not involve facilities construction.

IRP Site 21 (JP-5 Fuel Tank Spill, AST 1253). IRP Site 21 is located near the proposed MALS Maintenance facility, to be developed in both action alternatives. The extent of residual petroleum hydrocarbons in subsurface soils and groundwater beneath and adjacent to the AST 1253 site has been evaluated in previous investigations, including the Site Characterization Report, Aboveground Storage Tank 1253, December 2008, by Earth Tech, Inc., and the Environmental Hazard Evaluation (EHE) / Environmental Hazard Management Plan (EHMP) for Aboveground Storage Tank 1253, October 2009, by AECOM Technical Services, Inc.

The 2009 EHE / EHMP proposed the following:

- Free-phase product thickness monitoring in extraction and monitoring wells will continue at the AST 1253 site due to the presence of free-phase petroleum product.

- MCBH will enter an Administrative Boundary based on the established extent of the free-phase product plume to provide notice of environmental hazards for future construction projects.
- Administrative Notices will be provided to limit exposure of site users to the petroleum-containing subsurface soil. The Administrative Notices provide warning information to onsite construction workers and guidelines for excavations and dewatering operations.
- As part of the EHMP, the Navy requested Department of Health concurrence on Conditional No Further Action for the AST 1253 site. A Conditional No Further Action denotes that all response actions have been completed at the site, but long-term management activities remain to address AST 1253 subsurface fuel contamination,

New facilities proposed in Alternatives A and B would be designed and constructed in accordance with appropriate SOPs and BMPs (see Section 2.6.1.6) and guidelines provided above. Impacts associated with IRP Site 21 would be reduced with the implementation of the above measures.

No impacts would be associated with the No Action Alternative, which would not involve facilities construction.

IRP Site 2 (Quarry Pit Landfill). Figure 3-12 shows that a small portion of IRP Site 2 is within an area proposed for renovation and expansion of the Combat Logistics Battalion 3 (CLB-3) Medical Platoon Navy Personnel Unit Medical Logistics Building (Medical Warehouse) (Building 4088) proposed for both action alternatives. A draft RI report, entitled Draft Remedial Investigation/Feasibility Study for Quarry Pit Landfill (MCB Hawaii Site 0002), by Element Environmental, LLC, dated February 2012, is being prepared for IRP Site 2. Because the proposed renovation/expansion of the Medical Warehouse is not addressed in the draft RI report, further evaluation may be required for on-site development.

No impacts would be associated with the No Action Alternative, which would not involve facilities construction.

IRP Site 15 (End of Runway Disposal Area). IRP Site 15 is located near the proposed MV-22 aircraft apron under Alternative A; the site does not pose an environmental hazard and no further action is required.

USTs and ASTs

No impacts on USTs or ASTs would be associated with development of facilities under Alternative A or B. With the No Action Alternative, there would be no impacts. No mitigation is required.

Summary

At MCB Hawaii Kaneohe Bay, the ROI is the immediate area where the squadrons would operate and where construction is planned, as well as areas downstream that could potentially be affected in the event of a spill. SOPs and BMPs are in place for handling and management of hazardous materials and waste during construction and operations. Impacts would be minimized, given compliance with applicable laws and regulations and the base's Hazardous Waste Management Plan. Except for the proximity of the proposed MV-22 apron to IRP Site 15 under Alternative A (no action required), no differences in impacts are anticipated between the action alternatives.

3.10.3 AVIATION SAFETY

3.10.3.1 Introduction

This section provides information on aircraft safety, airfield safety (including airfield safety zones and Bird Aircraft Strike Hazards [BASH]), and wildland fire risk from aircraft operations at MCB Hawaii Kaneohe Bay. As aviation operations would be the same under Alternatives A and B, there would be no difference in impacts between the action alternatives.

The section on aircraft safety addresses the safety record of the MV-22 aircraft, as this is a relatively new aircraft having been in operational status since 2004, compared to the H-1 aircraft, which have been in service since the 1960s. The extent of aircraft safety impacts is based on compliance with required training/operation manuals, FAA regulations, and base SOPs. The ROI for aircraft safety is the aircraft's route.

The section on airfield safety discusses airfield layout rules requiring safety zones around runways. The ROI for airfield safety encompasses the safety zones around the runway at MCB Hawaii Kaneohe Bay.

The section on BASH addresses hazards of bird air strikes by aircraft, mainly upon takeoff and landing. The ROI is the areas where aircraft operate on the base, mainly the runways and landing zones.

Regarding wildland fires, fire mitigation/prevention procedures at the base are handled in accordance with aircraft operating procedures and with the base's wildland fire management plan (currently being updated). The ROI for wildland fires is the areas where aircraft operate on the base, mainly the runways and landing zones.

3.10.3.2 Affected Environment

Aircraft Safety

Aircraft safety is addressed in training/operation manuals, FAA regulations, and MCAS SOPs. The MV-22 operates in accordance with the Naval Air Training and Operating Procedures Standardization (NATOPS) manual. This manual provides measures and limitations on how to operate the aircraft. In addition, the Air Naval Tactics, Techniques, and Procedures (ANTTP) manuals are updated as needed to reflect changes in aircraft design, and lessons learned from training and deployments.

FAA regulations center on reducing the potential occurrence of aircraft accidents or mishaps. These could include collisions in the air with other aircraft or objects (such as birds), mechanical failures, weather, or pilot error. DoD provides the military services with regulations for reporting accidents (mishaps) and promoting aviation safety.

DoD classifies mishaps as Class A, B, or C (CNO 2010).

- **Class A.** $2 million or more in total property damage and/or aircraft destroyed. Injuries involve fatality or permanent total disability.
- **Class B.** $500,000 or more but less than $2 million. Injuries are permanent partial disability or three or more persons hospitalized as inpatients
- **Class C.** $50,000 or more but less than $500,000. Injures are nonfatal resulting in loss of time from work beyond day/shift when injury occurred.

Airfield Safety

The following is a discussion of management measures/procedures addressing airfield safety.

Aviation Safety Zones. The area surrounding a runway or helipad must be kept clear of objects that might damage an aircraft. Runways are bound by safety zones (also referred to as *imaginary surfaces*) that include a clear zone, accident potential zone, and transitional surface. Figure 3-13 illustrates these zones. Figure 3-14 shows the location of these zones at MCB Hawaii Kaneohe Bay. The location of clear zones and transitional surfaces at the base are also shown in Figure 2-3 in Chapter 2.

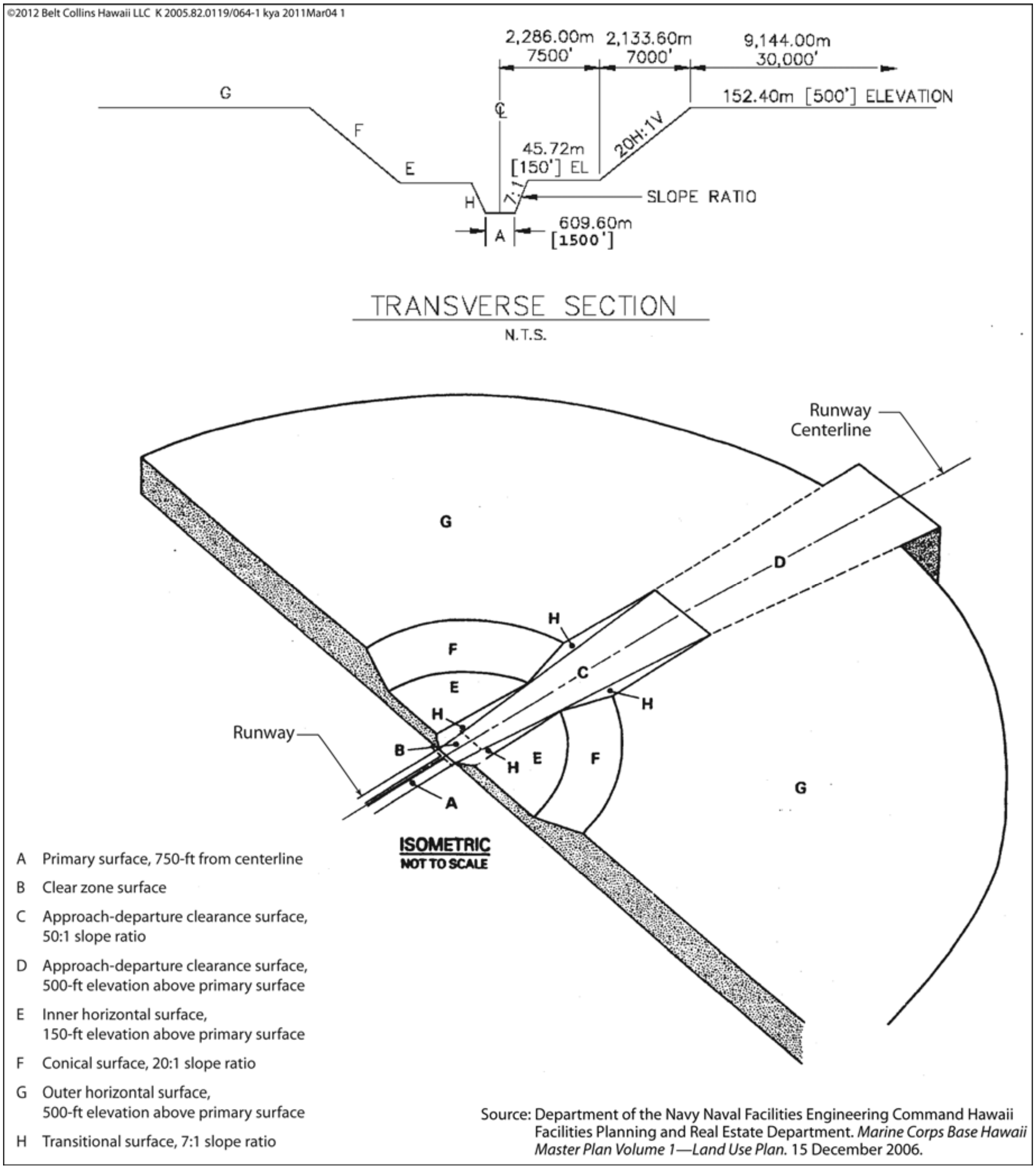

Figure 3-13. Airfield Safety Zones

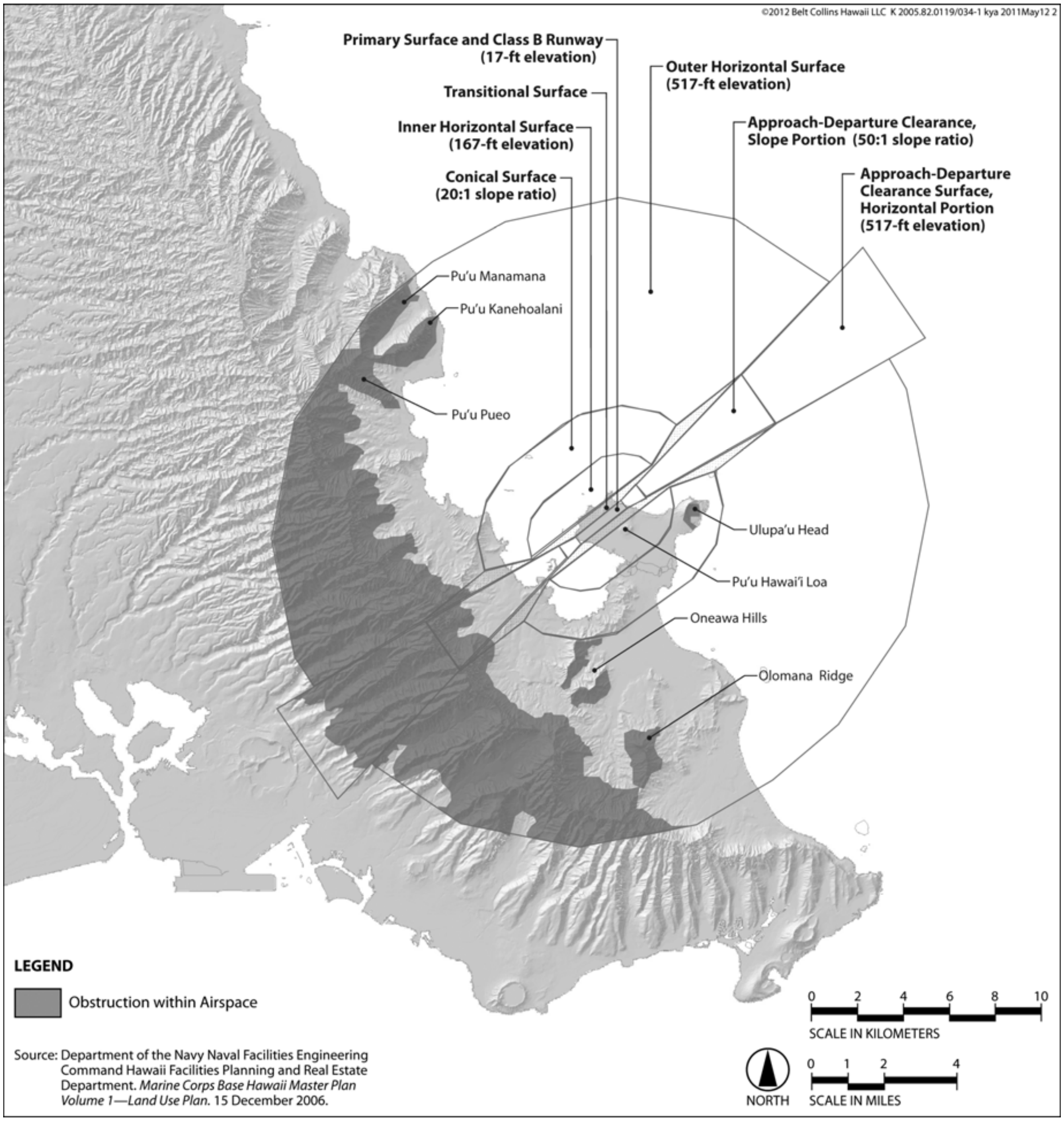

Figure 3-14. Safety Zones, MCB Hawaii Kaneohe Bay

Bird Aircraft Strike Hazards (BASH). Bird-aircraft strikes and the hazard that they represent are a safety concern for aircraft operations. (This issue is also addressed in the biological resources section.) MCAS, along with the USDA Animal and Plant Health Inspection Services Wildlife Services (APHIS WS), Department of the Navy (DoN), and transient users, have developed a BASH Plan (MCAF 2006) for aircraft operating at MCAS and throughout the Hawaiian islands. Additionally, APHIS WS also provides services at the airfield to reduce BASH risk. The MCAS BASH Plan covers:

- Safety and air operations procedures in known hazardous bird activity areas
- Aircrew education
- Procedures to reduce/remove/control bird attractants and habitats
- Airfield inspections

BASH Plan measures are also included in the 2006 MCB Hawaii Integrated Natural Resources Management Plan.

Wildland Fire

Brush and wildlife fires have potential to occur from training at vegetated areas such as Ulupau Head. Areas around the MCAS airfield are kept clear of vegetation.

Several plans and orders are in place to address fire response, control, and management, for example, Base Order 3302.1, Annex C (Operations) to Appendix 11 (Fire Response Management). A separate action, to develop a Wildland Fire Management Plan/EA for MCB Hawaii training areas (focused on flammable invasive grass-dominated areas such as at Ulupau Crater's weapons range and at MCTAB), is underway at the time of this writing, as required by the latest revision of MCO P5090.2A Change 2. This document and implementation program will improve and consolidate all existing fire response and prevention base actions and protocols to follow for prevention, response, and after-actions related to wildland fires.

3.10.3.3 Environmental Consequences

Aircraft Safety

Table 3-20 lists Class A mishap rates for the MV-22. From FY1999 through FY2001, the flight hours were for development and operational test flights (with two Class A mishaps). Since FY2004, the MV-22 has flown for 89,215 hours with one Class A mishap in FY2008, resulting in a mishap rate of 1.12. (Rate is determined by number of mishaps per 100,000 flight hours.)

Class A mishaps are the most severe and the rate that these occur at is used for safety comparisons. Class A mishaps are always investigated.

Table 3-20. Class A Flight Mishaps for MV-22

Year	Class A	Flight Hours	Class A Mishap Rate per 100,000 Flight Hours[3]
FY 99	0	416	0
FY 00	1	221	452.5
FY 01	1	470	212.8
FY 02[1]	None	None	
FY 03[1]	None	None	
FY 04[2]	0	1,986	0
FY 05	0	3,921	0
FY 06	0	5,767	0
FY 07	0	9,398	0
FY 08	1	14,034	7.13
FY 09	0	13,188	0
FY 10	0	16,668	0
FY 11	0	24,256	0
TOTAL	**3[4]**	**90,322**	**3.32**

Notes

1 Hours flown from FY99 through FY01 were developmental and operational test hours. From January 2001 through the mid-2002, the aircraft was grounded and received design changes as a result of the Blue Ribbon and NASA panels charged with investigating the aircraft after the crashes.

2 Aircraft returned to flight status

3 Mishap rate is calculated as Class A mishap number per 100,000 flight hours.

4 Total does not include the April 11, 2012 MV-22 crash that occurred in Morocco. (British Broadcasting Corporation. April 11, 2012. http://www.bbc.co.uk/news/world-africa-17685356)

Source. Navy Safety Center. December 2011.

Class A mishap data for the other Marine Corps aircraft are presented in Table 3-21. Mishap data for the CH-46 and CH-53s are included, as they represent the type of operations the MV-22 would conduct. The AV-8B Harrier can provide a comparison with the MV-22 regarding introducing new aircraft technology. The AV-8B introduced a jet-powered vertical take-off and landing capability in 1984. It is similar to the MV-22, using a fixed-wing airframe with vertical take-off capabilities.

Table 3-21. Historic Class A Flight Mishaps for U.S. Marine Corps

Year	H-46 (all types)			CH-53E			CH-53D			AV-8B		
	Class A	Flight Hours	Mishap Rate*	Class A	Flight Hours	Mishap Rate*	Class A	Flight Hours	Mishap Rate*	Class A	Flight Hours	Mishap Rate*
FY 64	0	147	0									
FY 65	1	9,034	11.07									
FY 66	2	33,442	5.98									
FY 67	17	75,236	22.60				1	9,006	11.10			
FY 68	24	92,108	26.06				8	26,392	30.31			
FY 69	29	161,595	17.95				7	36,046	19.42			
FY 70	21	140,406	14.96				5	40,251	12.42			
FY 71	9	132,350	6.80				7	43,798	15.98			
FY 72	9	96,042	9.37				4	46,632	8.58			
FY 73	6	93,971	6.38				10	43,969	22.74			
FY 74	6	68,509	8.76				4	43,702	9.15			
Jul-Dec 74	4	41,170	9.72				4	21,626	18.50			
CY 75	5	86,428	5.79	0	105	0.00	4	35,900	11.14			
CY 76	5	87,319	5.73	0	27	0.00	6	46,696	12.85			
CY 77	3	93,500	3.21	0	249	0.00	7	51,158	13.68			
CY 78	5	97,307	5.14	1	0	0.00	3	52,172	5.75			
CY 79	3	92,390	3.25	0	88	0.00	4	44,807	8.93	1	248	403.23
Jan-Sep 80	4	66,689	6.00	0	0	0.00	3	29,302	10.24	0	93	0
FY 81	8	88,951	8.99	0	160	0.00	4	42,154	9.49	0	70	0
FY 82	5	92,300	5.42	0	4,629	0.00	2	44,036	4.54	0	431	0
FY 83	3	99,406	3.02	0	10,629	0.00	2	47,432	4.22	0	821	0
FY 84	3	106,039	2.83	1	16,259	6.15	2	47,889	4.18	0	1,573	0
FY 85	2	106,883	1.87	4	19,152	20.89	2	49,745	4.02	1	8,195	12.20
FY 86	7	110,743	6.32	1	22,748	4.40	0	44,764	0.00	2	18,467	10.83
FY 87	5	118,331	4.23	1	16,081	6.22	1	47,264	2.12	5	22,212	22.51
FY 88	4	112,606	3.55	0	21,075	0.00	2	49,290	4.06	3	37,415	8.02
FY 89	4	112,365	3.56	0	25,431	0.00	1	49,166	2.03	5	43,570	11.48

Table 3-21. Historic Class A Flight Mishaps for U.S. Marine Corps

Year	H-46 (all types)			CH-53E			CH-53D			AV-8B		
	Class A	Flight Hours	Mishap Rate*	Class A	Flight Hours	Mishap Rate*	Class A	Flight Hours	Mishap Rate*	Class A	Flight Hours	Mishap Rate*
FY 90	4	98,775	4.05	1	27,385	3.65	1	47,472	2.11	11	48,644	22.61
FY 91	3	110,122	2.72	1	30,269	3.30	2	38,478	5.20	6	55,590	10.79
FY 92	4	96,834	4.13	1	28,598	3.50	3	28,114	10.67	7	56,873	12.31
FY 93	5	106,743	4.68	1	31,903	3.13	2	23,980	8.34	4	55,488	7.21
FY 94	2	98,796	2.02	0	33,779	0.00	2	23,427	8.54	5	51,603	9.69
FY 95	1	96,115	1.04	0	34,345	0.00	0	22,339	0.00	5	51,128	9.78
FY 96	5	90,401	5.53	0	24,867	0.00	0	22,413	0.00	6	50,232	11.94
FY 97	3	81,816	3.67	0	26,439	0.00	0	18,846	0.00	4	39,060	10.24
FY 98	1	87,321	1.15	0	30,327	0.00	1	21,388	4.68	4	33,209	12.04
FY 99	1	84,346	1.19	1	29,408	3.40	1	20,524	4.87	7	30,441	23.00
FY 00	1	92,849	1.08	0	32,739	0.00	1	21,955	4.55	2	22,088	9.05
FY 01	2	91,708	2.18	0	28,660	0.00	0	20,022	0.00	1	32,372	3.09
FY 02	2	90,287	2.22	1	36,144	2.77	2	20,387	9.81	3	43,078	6.96
FY 03	2	79,390	2.52	0	37,340	0.00	1	20,495	4.88	3	47,103	6.37
FY 04	1	63,436	1.58	2	35,010	5.71	1	19,705	5.07	2	40,775	4.91
FY 05	1	71,758	1.39	1	34,595	2.89	2	17,203	11.63	5	37,969	13.17
FY 06	0	59,676	0.00	1	33,321	3.00	0	16,925	0.00	3	40,467	7.41
FY 07	1	56,330	1.78	1	33,828	2.96	0	20,152	0.00	1	34,519	2.90
FY 08	1	41,032	2.44	0	29,842	0.00	1	11,926	8.39	4	29,284	13.66
FY 09	0	36,558	0.00	0	24,768	0.00	0	12,138	0.00	1	24,925	4.01
FY 10	0	29,388	0.00	0	30,575	0.00	0	15,271	0.00	1	33,645	2.97
FY11	**0**	**29,975**	**0**	**0**	**29,235**	**0.00**	**1**	**9,062**	**11.04**	**1**	**30,299**	**3.3**
Total	**234**	**4,108,923**	**5.69**	**19**	**820,010**	**2.32**	**114**	**1,465,418**	**7.78**	**103**	**1,021,887**	**10.08**

1 Source: Navy Safety Center. December 2011.
2 * per 100,000 flight hours

These tables compare the safety record of the MV-22, a relatively new aircraft with over 90,000 flight hours, with aircraft that have been in operation for decades and have flight hours in the range of approximately 800,000 to more than 4 million. The MV-22's Class A mishap rate of 3.32 per 100,000 flight hours is below the average rate for three of the four aircraft in Table 3-21. The MV-22's 3.32 mishap rate includes the period when the aircraft was in its developmental/test flight stage (1999 to 2001). With the return of the MV-22 to operational status in 2004, one Class A mishap (Table 3-20) has occurred, for a rate of 1.12 per 100,000 flight hours.

By comparison, the H-1 aircraft experienced the following Class A mishaps from FY99 to FY11:

- UH-1N Huey: 8 mishaps; 263,779 flight hours; mishap rate of 3.03 per 100,000 flight hours.
- AH-1W Cobra: 14 mishaps; 548,004 flight hours; mishap rate of 2.55 per 100,000 flight hours (NSC 2010).

Airfield Safety

Aviation Safety Zones. None of the action alternatives would result in significant airfield safety impacts. All airfield improvements at MCAS Kaneohe Bay would be designed to comply with U.S. Navy and DoD requirements for runway clear zones, accident potential zones, and transitional surfaces. There would be no change with the No Action Alternative and, therefore, no impacts.

Bird Aircraft Strike Hazards (BASH). A BASH Plan is in place at MCAS, and on-base USDA staff implements measures to reduce BASH risk. To avoid bird air strikes, the squadrons would comply with procedures specified in the MCAS BASH Plan. With implementation of these procedures, no significant impacts would be associated with the action alternatives. No additional mitigation is required. There would be no change related to BASH with the No Action Alternative.

Wildland Fire

Areas to be developed under Alternatives A and B would be located at MCAS, with no facilities planned at or near Ulupau Head. The firing ranges and training areas located at Ulupau Head would not be used for aviation training. An increase in use of the range for training by additional personnel is expected. All personnel using the range would follow existing orders and procedures to prevent fires. Plans are in place to respond to wildfires at the range. An update to the existing wildland fire management program is in progress as cited in Section 3.10.1.2 and will be fully implemented by the time the MV-22 aircraft arrive.

The MV-22 aircraft would land and take-off at the runway and designated landing zones. Both Alternatives A and B include projects at MCB Hawaii Kaneohe Bay to reinforce existing LZs with asphalt. Wildland fires are not likely to occur, as the areas around the runway, taxiways, and LZs are kept clear of vegetation. With the No Action Alternative, there would be no increased fire risk.

Summary

Introduction of the VMM and HMLA squadrons would not result in significant aviation safety impacts under either Alternative A or B. All new facilities at MCB Hawaii Kaneohe Bay would meet airfield safety requirements. The existing runway meets MV-22 airfield requirements for night training, instrument procedures, local runway pattern work, and runway and overrun lengths. Regarding aircraft safety, mishap rates for both the MV-22 and H-1 aircraft reflect favorable safety records. BASH risk would be managed through compliance with MCB Hawaii's current BASH Plan and the base's contract with APHIS WS for BASH control. Regarding wildland fire risk, the MV-22 would land at and take off from the airfield and paved LZs kept clear of vegetation. Given these conditions, the aircraft deflector systems, and the base's existing wildland fire management and response protocols, the risk of fire caused by MV-22 exhaust is highly unlikely. No additional mitigation measures are required for aviation safety. No impacts would be associated with the No Action Alternative.

3.10.4 ORDNANCE SAFETY

3.10.4.1 Introduction

The extent of impacts associated with ordnance is determined by compliance with established siting and design standards to avoid encroachment issues. The ROI is the area potentially encumbered by ordnance storage facilities, defined by ESQD arcs. In Alternative B, VMM facilities are proposed for siting at West Field, where ordnance is stored. The site was analyzed to assure that it did not occur within existing ESQD arcs (see Figure 3-12). There would be no difference in ordnance safety between Alternative A and B.

3.10.4.2 Affected Environment

MCB Hawaii Kaneohe Bay stores and maintains ordnance for mission requirements. The ordnance is controlled and maintained in accordance with Marine Corps, Navy, and DoD Explosives Safety Board (DDESB) procedures. Ordnance is stored at existing magazines located at Ulupau Head. Ordnance assembly is conducted in the Ordnance Assembly Area

(OAA), and loading ordnance on to the aircraft is done at the Combat Aircraft Loading Area (CALA). There is also an ordnance arm/de-arm area on the runway.

For the CALA and OAA, safety arcs are in place when those sites are active. These ESQD arcs are established by DDESB guidelines. Storage facilities are encumbered by permanent ESQD arcs, their size depending on the type of ordnance. None of the proposed facilities under either Alternative A or B is located within these ESQD arcs.

3.10.4.3 Environmental Consequences

Under both Alternatives A and B, no facilities would encroach within existing ESQD arcs. All new facilities are planned to be outside the arcs. Under the No Action Alternative, there would be no impacts relating to ordnance and explosive safety.

Ordnance storage would comply with existing restrictions. The proposed action would increase the storage requirement, and existing facilities are capable of storing additional ordnance. The squadrons would operate in accordance with the base's ordnance safety requirements. No impacts related to ordnance storage would occur.

Summary

Neither action alternative would result in significant ordnance safety impacts. No mitigation is required. With No Action, there would be no ordnance safety impacts.

3.11 SOCIOECONOMICS

3.11.1 INTRODUCTION

The basing of new squadrons at MCB Hawaii Kaneohe Bay could potentially affect surrounding communities, notably due to increased demand for housing and public facilities. This section evaluates how the proposed action would affect or contribute to changes in demographics, the housing market, the economy (employment and income), community organization, public facilities, and public safety and health services. Because the number of assigned Marines and dependents would be the same for Alternative A and Alternative B, socioeconomic impacts would be the same for these two action alternatives.

For the socioeconomic assessment, the region of influence is largely determined by the location of housing for newly assigned Marines and dependents. As of 2010, 9,872 Marines and dependents resided on-base.[29] More than half of the Marines living off-base reside in Kailua and Kaneohe. Table H-1 in Appendix H shows their addresses by region. Most of the Marines in the squadrons without on-base housing would likewise seek homes in Kailua or Kaneohe, with remainder dispersed around the island.

The Census Defined Places (CDPs) of Kaneohe Station (i.e., MCB Hawaii Kaneohe Bay), Kailua, and Kaneohe demarcate the region in which nearby demand for housing and related services is likely to be felt most strongly. The entire island of Oahu (the City and County of Honolulu) is considered the overall region of influence, since Marines can and will find housing across the island. (Figure H-1 in Appendix H shows CDPs on the island of Oahu.)

3.11.2 AFFECTED ENVIRONMENT

Demographics

Table 3-22 provides recent Census data on the number and characteristics of persons in the state, the county, and the CDPs of interest. (Counts of population and housing units are from the 2010 Census; all other data are gathered from results of the 2005 through 2009 American Community Survey [ACS].)[30] MCB Hawaii Kaneohe Bay (Kaneohe Station CDP) stands out from the surrounding communities in several ways.[31] The base population is young and most are male. Racial distribution resembles that of the continental U.S. rather than Hawaii, with few Asians or Native Hawaiians, and a lower incidence of multi-racial identification.

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29 This figure includes UDP Marines who may be deployed away from Hawaii. The breakdown is 3,398 in bachelor enlisted and officer quarters, 2,216 in family housing, and 4,258 dependents.

30 The American Community Survey (ACS), the source for most of the Census information, is a sample survey conducted annually. All Census blocks – areas smaller than a Census tract or CDP – are allocated to five strata, and each stratum is sampled in a given year of a five-year cycle. Since different blocks are sampled in different years, the results may miss demographic changes that occurred in a block after the year it is sampled. The information from the 2005 through 2009 surveys is the first ACS data available for CDPs and tracts.

The 2010 decennial Census is designed as a count of the entire population, and is hence both more accurate and more precisely time-bound than the ACS.

Since the ACS data were collected earlier than the 2010 Census, and from a sample of the population, they are cited here largely in the form of percentages, rather than absolute figures. This approach is also designed to help comparison among different areas.

31 CDP = Census Designated Place. The Kaneohe Station Census Defined Place includes a few civilian homes (notably along the north side of Aikahi Loop) along with MCB Hawaii Kaneohe Bay.

Table 3-22. Demographic Characteristics

	State of Hawaii	City and County of Honolulu	Kaneohe CDP[1]	Kaneohe Station CDP	Kailua CDP
Population					
Total Population, 2010 Census	1,360,301	953,207	34,597	9,517	38,635
Total Population, ACS	1,280,241	902,564	33,270	10,809	34,306
Male	50.6%	50.6%	48.0%	66.2%	50.6%
Female	49.4%	49.4%	52.0%	33.8%	49.4%
Under age 18	22.6%	22.3%	22.0%	26.3%	22.7%
Age 18 to 64	63.3%	63.2%	61.0%	73.6%	62.5%
Age 65 and up	14.1%	14.5%	17.0%	0.1%	14.8%
Median Age (years)	37.5	36.9	40.2	21.7	40.9
Race[2]					
White	42.7%	38.2%	44.6%	76.8%	68.3%
Black or African American	3.8%	4.7%	2.8%	10.1%	1.9%
American Indian and Alaska Native	2.3%	2.1%	2.2%	3.6%	2.7%
Asian	55.0%	59.1%	58.4%	5.8%	37.3%
Native Hawaiian and Other Pacific Islander	23.1%	21.5%	33.2%	2.4%	19.9%
Some other race	2.5%	2.4%	3.5%	9.5%	1.8%
Total % of races recorded	129.5%	128.1%	144.7%	108.1%	132.0%
Hispanic or Latino	8.6%	7.9%	9.9%	14.2%	6.3%

Note: 2010 Census data are shown in italics, to distinguish them from earlier ACS data.
1 CDP = Census Designated Place.
2 Federal definitions, can record more than one race per person
Sources: American Community Survey results for 2005 to 2009; 2010 US Census.

Demographically, Kailua and Kaneohe are older communities (as shown by the median age). In racial terms, Kaneohe has significant White, Asian, and Native Hawaiian populations, while Kailua stands out as an area with a White majority. Some 70 percent of Kaneohe CDP residents were born in Hawaii. In contrast, 53 percent of Kailua residents and only 10 percent of Kaneohe Station CDP residents were born in the state (according to ACS 5-year data).

The 2010 Census data show slight population growth in nearly all areas over the estimated population in the ACS. However, the 2010 population at Kaneohe Station is less than the ACS estimate (88 percent of the estimate), while the 2010 population for the Kailua CDP is appreciably larger (113 percent) than the ACS estimate.

Kaneohe Station and Kailua stand out in terms of federal racial categories as areas with high concentrations of Whites. This is also true for young families. Recent school data (using a wider range of categories) show Mokapu (located on-base) and Aikahi Elementary Schools (located near the base) to have predominantly White student bodies, while Hawaiians or Part-Hawaiians form the largest ethnic group in Kaneohe and Waimanalo schools, as shown in Figure F-2 in Appendix H.

Population growth on the island of Oahu is expected to be slow in the coming years. According to the City and County of Honolulu Department of Planning and Permitting, the district population is projected to decline and the number of housing units would increase only slightly. These population and housing forecasts, shown in Table H-2 in Appendix H, are based on local demographics, proposed housing development, and City and County policies.[32]

Housing

MCB Hawaii Kaneohe Bay has both bachelor and family housing. The latter includes older homes and new ones built through a public-private venture with Forest City Housing. As reported by base housing staff in December 2010, on-base housing accommodates 3,398 bachelor personnel and 2,216 families.[33]

By the end of 2014, the number of family housing units at MCB Hawaii Kaneohe Bay is expected by base staff to reach 2,592 units. (A portion of family housing units will be out of service until renovations and replacements are completed in 2014.) No further on-base family housing development is proposed.

In recent years, Oahu's housing supply has increased slowly. This change is reflected in the difference between 2010 Census housing counts and 2005–2009 ACS counts for the island as

[32] The City and County of Honolulu Department of Planning and Permitting projections (available at http://honoluludpp.org/planning/demographics2/Projections/2000-2035byDPA.pdf) start from county-level projections developed by the State Department of Business, Economic Development and Tourism. Those are allocated to the Development Plan or Sustainable Communities Plan (SCP) areas and sub-areas based on anticipated local housing supply and demand, along with the overall City and County policy to direct growth to the Primary Urban Center, Ewa and Central Oahu.

[33] Rippel, Ray and Randall Tanaka. Email to Belt Collins Hawaii. December 2010.

a whole (see Table H-3 in Appendix H). By 2010, the number of housing units increased in the Kailua CDP, in relation to the ACS estimate, at about the same rate as population. At Kaneohe Station, the number of units counted in 2010 was below the ACS estimate. Housing occupancy increased in the Kaneohe Station CDP to the level found for the two adjoining CDPs. (In 2010, the occupancy rate for Kaneohe CDP was 96.4 percent, for Kaneohe Station CDP was 95.8 percent, and for Kailua CDP was 94.7 percent.)

The large majority of Kailua and Kaneohe households are owner-occupied. In contrast, Kaneohe Station CDP family households consist almost entirely of renters. The average household size of the MCB Hawaii Kaneohe Bay family population is larger than for the adjoining areas and the island as a whole. Most of those families include dependent children, while less than a third of households in other areas consist of families with dependents under 18 years of age.

Average rents in the area surrounding MCB Hawaii Kaneohe Bay are higher than for the City, as shown in Table H-4 in Appendix H. Average rents paid for family housing on-base are even higher.

Many in Hawaii pay a large share of their income for housing. This is especially true for renters. While the share of households at Kaneohe Station paying over 35 percent of their income for housing is extremely high, this may be due to the difference between military pay, which does not include housing allowances, and civilian salaries.

Economy

Kaneohe and Kailua are affluent communities (see Table H-5 in Appendix H), while residents of Kaneohe Station—Marines in bachelor quarters and Marine families in family housing—earn much less than residents of these surrounding communities. Unemployment was low during the ACS survey period (2005–2009). MCB Hawaii Kaneohe Bay has a sizeable number of civilian workers who are overwhelmingly military dependents. If members of the armed forces are excluded, the labor force participation rate for the remaining adults in the CDP (i.e., for military family members) is 62.2 percent.

Nearly half of the civilian workers living in the Kaneohe Station CDP work for government agencies, while the other half work for private employers. Very few (1.3 percent) are self-employed. (Island-wide, 6.5 percent of civilian workers are self-employed. In the Kailua CDP, the self-employed account for 11.9 percent of civilian workers.)

Community Organization

Hawaii has no incorporated communities smaller than the counties. Civilian communities have elected advisory boards under the City. The following are in Windward Oahu: Neighborhood Boards No. 29 (Kahaluu), 30 (Kaneohe), 31 (Kailua), and 32 (Waimanalo). (No board was formed for MCB Hawaii Kaneohe Bay.) These boards provide a forum for discussion of local issues and response to development proposals. In addition, smaller areas may have community associations. Other organizations active in the region include Ahahui Malama i ka Lokahi, devoted to the restoration of Kawainui Marsh, and Paepae o Heeia, an environmental, cultural and educational non-profit which is restoring Heeia Fishpond.

Public Facilities

Public facilities are provided to MCB Hawaii Kaneohe Bay by the federal, state, and county governments, and private agencies. This section deals with education and recreation. Public safety and health services are discussed in the following section.

Schools. The State Department of Education (DOE) provides schools throughout the state, including an elementary school on-base at MCB Hawaii Kaneohe Bay. In addition, about 15 percent of the state's elementary and secondary school population is enrolled in private schools. Schools in Windward Oahu include:

DOE Kailua-Kalaheo Complex (Kailua and Waimanalo): 6,433 students in 2010-2011[34]

- Kalaheo High School
- Kailua High School
- Kailua Intermediate School
- Mokapu Elementary School (on base) and nine other elementary schools

DOE Castle Complex (Kaneohe and Kahaluu): 4,852 students in 2010-2011[35]

- Castle High School
- King Intermediate School
- Eight elementary schools

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[34] State Department of Education enrollment totals posted at http://lilinote.k12.hi.us/STATE/COMM/DOEPRESS.NSF/a1d7af052e94dd120a2561f7000a037c/82e939b60ecbec820a2577c00081dc60?OpenDocument and accessed in January 2011.

[35] State Department of Education enrollment totals posted at http://lilinote.k12.hi.us/STATE/COMM/DOEPRESS.NSF/a1d7af052e94dd120a2561f7000a037c/82e939b60ecbec820a2577c00081dc60?OpenDocument. Accessed in January 2011.

Private Schools

- Le Jardin Academy (grades PK-12)
- St. Anthony Parish School (PK-8)
- St John Vianney (PK-8)
- St. Anne's Model Schools (1-8)
- Trinity Christian (PK-10)
- St. Mark Lutheran (K-8)
- Koolau Baptist Academy (K-12)

MCB Hawaii Kaneohe Bay provides preschool and childcare services for Marine families. Two existing facilities have a total of 295 preschool and childcare spaces. They serve a greater number of children, since some receive half-day care. Currently, a waitlist includes 42 children without childcare and 60 in family day care or the like.[36] A new facility, to open in late-2011, will provide another 122 spaces. Private providers are located on-base and throughout the region.

Recreation

MCCS operates a wide range of recreation facilities on the base, including a golf course, marina, and beaches. The Air Force maintains beach cottages and recreational facilities at Bellows Air Force Station (adjoining MCTAB) in Waimanalo. Off base, the City and County of Honolulu has regional and neighborhood parks, beach parks, and a large botanical garden in the Koolaupoko region. The State of Hawaii Department of Land and Natural Resources Na Ala Hele program manages several trails in the region.

Public Safety and Health Services

Fire Control. The Honolulu Fire Department maintains stations at Kailua, Aikahi, Olomana, and Kaneohe with a total of six engine companies. The Kaneohe station is the headquarters for Battalion 3 (of five battalions).

MCB Hawaii Kaneohe Bay has a Federal Fire Department station, and an Aircraft Rescue and Fire Fighting unit at MCAS Kaneohe Bay.

Police. The Honolulu Police Department's District 4, stretching from Waimanalo to Kahuku, has 196 authorized officers in 22 beats (City 2011). The Kaneohe station serves as district

[36] Personal communication, Janet Hooten, Director, Child Development Center to Belt Collins Hawaii, January 2011.

headquarters; a substation is located in Kailua. On the base, military police are responsible for security and public safety; civilian police respond to calls on-base when invited by military authorities.

Medical Facilities. Castle Medical Center in Kailua is the primary medical center for Windward Oahu. For military personnel and dependents, care is available at on-base clinics, at Tripler Army Medical Center, or from private-sector physicians through the Tricare program.

The City's Department of Emergency Services has emergency medical service units based at the Kailua and Kaneohe fire stations. The Federal Fire Department at MCB Hawaii Kaneohe Bay also has emergency medical technicians and vehicles.

3.11.3 ENVIRONMENTAL CONSEQUENCES

Demographics

Although the aviation squadrons would base approximately 1,000 new Marines at MCB Hawaii Kaneohe Bay, the squadrons would be off-island for long periods, for combat deployments, scheduled training events and exercises, or unit rotations as part of the Unit Deployment Program (UDP). A third of the Marines in the aviation squadrons would be at other bases in the Western Pacific at any time under UDP. Some dependents of deployed Marines stay on-island, while others move elsewhere, often back to the continental U.S. to stay with their families. (Table 3-23 incorporates assumptions about the share of dependents remaining on-island, based on a 2008 count.)

Table 3-23 shows island-level population impacts of the establishment of the new aviation units at MCB Hawaii Kaneohe Bay for both Alternatives A and B. The new population on island is estimated as 1,565 persons at any given time, i.e., 667 marines and 898 dependents. The new population with the action alternatives would amount to 2.7 percent of the population increase forecast for the City from 2010 to 2020. It would be a small share of overall growth and would occur over several years. Consequently, no sudden increase in population is anticipated in any given year. With the No Action Alternative, this increase in population would not occur.

Housing

The new Marines and families would be assigned to a post with limited housing. New family housing scheduled to be built by 2014 would address current deficiencies but cannot be expected to provide for the families associated with the VMM and HMLA squadrons.

Table 3-23. Population Impacts

	Marines			Dependents
	Total	Bachelors	Families	
Total Population				
Senior Officers (O4 to O9)	50	4	46	137
Junior Officers (W to O3)	116	45	71	154
Senior Enlisted (E6 to E9)	141	14	127	349
Junior Enlisted (E1 to E5)	693	416	277	437
TOTAL	1,000	479	521	1,077
Population in Hawaii				
Minus deployed under UPD	333	160	174	
In Hawaii[1]	667	319	348	898

Notes

1 Share of dependents living on island estimated by Belt Collins Hawaii. The off-island share is estimated as half the dependents associated with deployed Marines, i.e., 16.7 percent of all dependents. A recent demographic report showed 22 percent of MCB Hawaii Kaneohe Bay spouses living off-island.

Source: Based on Feb 2010 Defense Manpower Data Center (DMDC) reports: (1) Marine Corps Marital Status Report and (2) Marine Corps Number of Children Report. Family off-island estimate adapted from MCCS, *February 2008 Base Demographic Report.*

The proposed action includes provision of some 608 new bachelor housing billets (304 rooms with maximum occupancy of 2+0). Under Alternative A, this would be accomplished through new construction, along with demolition of 384 spaces in older BEQs. Under Alternative B, construction of two new buildings would still account for 608 billets, but two of the six older buildings would be retained for reuse. Under both alternatives, the net addition to the bachelor housing stock comes to space for 224 Marines.

Currently, the Housing Office has vacant space in bachelor officer quarters and bachelor enlisted quarters. Conceivably, all unaccompanied personnel from the new squadrons could be lodged at MCB Hawaii Kaneohe Bay. However, other units would increase demand for bachelor quarters and for family housing before 2018, when all VMM and HMLA personnel are expected to be posted at MCB Hawaii Kaneohe Bay. To estimate the full potential impact, it is appropriate to assume that no space on base beyond the net new bachelor housing would be used by members of the new squadrons. That assumption provides a maximal impact scenario for housing demand outside the base.

Marine Corps housing policy calls for bachelor (unaccompanied) enlisted marines at levels E-5 and below to live in bachelor quarters. With one unit in three deployed under UDP at any time, the demand for bachelor enlisted housing from these pay grades in the new squadrons would total about 277 spaces. At least 53 spaces—277 Marines minus the 224 net new BEQ spaces—would be needed off-base for junior enlisted bachelors, along with spaces for higher ranks. However, once a Marine qualifies for the Basic Allowance for Housing (BAH), he or she can retain that allowance during deployments. As a result, some of the deployed Marines could continue to rent on Oahu. Assuming that deployed Marines do continue to rent, the demand for housing off-base for junior enlisted would then increase to about 80 units, along with about 63 for senior enlisted and officers.

Demand for housing from the aviation squadrons would stabilize after they are all posted to MCB Hawaii Kaneohe Bay. Assuming that quarters on base are very limited, the new demand would be for as many as 578 units, as follows:

On- base	Junior enlisted in BEQ	224[1]
Off- base, on Oahu	Bachelors	
	Junior enlisted on-island	53
	Junior enlisted, UDP, with BAH	27
	Senior enlisted (both on-island and UDP)	14
	Officers	49
	Families	
	On -island	348
	Marine deployed, family on-island	87
	Total demand for housing off base	578

Notes

1 Not a source of housing demand beyond the base.

If all of these Marines rent, they would increase rental demand on Oahu by a very small amount (about 0.4 percent, based on the data in Table H-3 in Appendix H). That demand would likely be dispersed unevenly. If new demand is distributed geographically, much as demand is distributed now, it would be as shown in Table 3-24.

Table 3-24. Anticipated Housing Demand by Local Area

	Families	Bachelors	Total	Share
Windward Oahu	241	83	324	56%
Kailua	138	52	190	33%
Kaneohe	100	29	128	22%
Waimanalo	3	2	5	1%
Honolulu	80	36	116	20%
Leeward Oahu	93	18	112	19%
Central Oahu and North Shore	21	6	27	5%
Totals	435	143	578	100%

Note: See Table H-1 in Appendix H for definition of regions. New demand allocated to regions in proportion to existing location of Marines posted to MCB Hawaii Kaneohe but living off-base on Oahu.

Table 3-25 shows that demand can be compared to the local rental housing supply by drawing on data compiled in 2006 from Real Property Tax Data.

Table 3-25. Anticipated Project Housing Demand in Relation to Rental Housing Stock

	Rentals, 2006			Project Housing Demand	
	Single Family	Condo	Total	Units	Share of Supply
Windward Oahu	7,666	2,434	10,100	324	3.2%
Honolulu	17,036	39,509	56,545	116	0.2%
Leeward Oahu	20,551	16,317	36,868	112	0.3%
Central Oahu and North Shore	5,915	1,386	7,301	27	0.4%
Totals	51,168	59,646	110,814	578	0.5%

Source: SMS Research. 2006. Hawaii Housing Policy Study: Data Tabulations, Table G-3.

The new demand would amount to a very small increase for most of the island. In Windward Oahu, especially in Kailua, increased demand by some 3.2 percent could well be noticed. However, that demand would develop over time as the new squadrons come to MCB Hawaii Kaneohe Bay. No sudden increase in demand for rental housing is anticipated.

The City and County's projections of new housing units indicate that the housing supply in the Koolaupoko district will grow by 1,800 units between 2010 and 2020, even though no increase is included for family housing on base. New housing demand from aviation units could account for less than 20 percent of that new construction. Net civilian population growth in the region is expected to amount to only 1,909 persons, i.e., perhaps 650 households. Anticipated housing development should be able to accommodate not only local demand from both Marines and civilians but also arrivals from other parts of Oahu. However, little new housing is built on Oahu for renters. Most or all new units will most likely be sold fee simple. A few of these might then be rented. With an increase in the housing supply, other homes might be available as rentals.

The ACS data in Appendix H suggest that about 6,670 housing units in the Kailua and Kaneohe Census Designated Places are rentals. Even if all of the new Windward Oahu housing demand associated with the aviation squadrons were located in those areas, it would still amount to less than five percent of the recent rental supply. With the new demand arising over a period of years, this increase would be gradual.

However, Marines at the E-5 pay grade or higher levels who qualify for BAH have appreciably more money for housing than the recent average rents in the Kailua and Kaneohe CDPs (shown in Appendix H). Since BAH rates are known, local landlords are expected to set rents by Marines' ability to pay. In this situation, some civilian renters may find rents in these communities too high and may choose to move elsewhere on the island. Marines based at MCB Hawaii Kaneohe Bay similarly are found in all regions of the island, so this dispersion is shared by civilians and the military. With an increase in the number of Marines renting in Windward Oahu, competition between civilians and Marines for housing would increase slightly and could affect a slightly more affluent range of renters than at present.

The new housing demand for both Alternative A and B is seen as having impacts but not reaching an unacceptable level. No mitigation is required. No new housing demand would be generated by the No Action Alternative.

Members of the local community have expressed concern that the increased aviation noise associated with the project would tend to reduce residential property values. In response, the history of single family home sales in Kaneohe from 1985 onwards was reviewed, comparing average annual sales in the regions near the bay (i.e., makai of Kamehameha Highway) with sales further inland (for Tax Map Key sections 1-4-4 through 1-4-6), and with islandwide averages. Until the late 1990s (during a period when Hawaii was experiencing a recession and when jets were based at the Marine Corps Air Station), average sale prices in both parts of

Kaneohe were well below the island average. Since the late 1990s, sale prices for homes in the area near the bay have risen to about the same level as islandwide averages. Inland Kaneohe prices have not risen. While many factors contribute to property values, the data suggest that the noise levels associated with current operations do not depress home values near Kaneohe Bay. Moreover, since the noise levels associated with the proposed action would be lower than these historic levels, no impact on property values is expected.

Economy

Construction Employment and Wages. Introduction of the new squadrons would demand substantial investment in new facilities, generating employment in construction and the industries that support it. The construction employment generated can be projected from the estimated cost of new construction. Table 3-26 presents approximate construction costs, while Table 3-27 derives direct, indirect, and induced employment.[37]

Construction of Alternative A would involve, on average, 581 direct jobs and 776 additional jobs in the economy yearly from 2014 through 2018.[38] For Alternative B, the average job count would be 757 direct jobs and 968 indirect and induced jobs.

The total impact of project construction on wages in Hawaii's economy is estimated as $347 million over five years for Alternative A and $443 million for Alternative B. No construction wage impacts would occur under the No Action Alternative.

Nearly all construction work listed in Table 3-26 would be located at MCB Hawaii Kaneohe Bay. Construction workers can be expected to live throughout Oahu; some could live on other islands. The impact would not be localized in the Windward area.

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[37] Direct jobs are in firms engaged in construction. Indirect jobs are in firms supplying materials or other items to the firms engaged in construction. Induced jobs are created in the regional by direct and indirect workers' spending of their wages.

[38] As a rule of thumb, about 80% of direct construction jobs are at the job site. Other jobs are in offices and yards. The actual number of construction workers would vary depending on the share of the project-related construction under way at any particular time.

Table 3-26. Approximate Construction Cost

		Approximate Construction Cost (million 2010 $s)[1]
Alternative A		
VMM facilities		$232
HMLA infrastructure		$34
MALS-24 maintenance facilities		$97
MAG-24 Headquarters		$60
Bachelor housing		$183
Landing zone improvements[2]		$6
Total		$611
Alternative B		
VMM facilities (based on adjusted Alt. A)		$242
less demolition (52,500 sf less) [3]	-$1,441,571	
less replacement (34,100 sf less) [3]	-$9,040,659	
HMLA infrastructure		$34
MALS-24 maintenance facilities		$97
MAG-24 Headquarters		$60
Bachelor housing		$183
Landing zone improvements[2]		$6
New runway underpass		$175
Total		$797

Notes

1 All construction costs are in 2010 dollars. For projects, estimated costs had been escalated to the mid-point of construction. To adjust back to 2010 dollars, the annual escalation factors in the *Unified Facilities Criteria DoD Facilities Pricing Guide for FY 2010 (*UFC 3-701-01 , updated June 2011), Table 4.2 were used. These are planning cost estimates, to be refined in the design process. Cost estimates are rounded to the nearest $1 million.

2 New construction would be needed at MCB Hawaii Kaneohe Bay; at other landing sites, renovation and expansion would be needed. These are all combined here, since the work would likely be done under contracts for the landing zones as a whole, rather than for sites on one island.

3 VMM facilities for Alternative B would be much the same as for Alternative A. To account for the differences, demolition and replacement costs per square foot were treated as comparable for the two alternatives, and the total cost was adjusted to reflect reduced demolition and replacement.

4 While BEQ configuration differs in Alternative B, the construction cost is treated here as the same for both alternatives.

Sources: MCBH facilities planning documents; recent updates; with dollar values converted to 2010 as per UFC 3-701-01.

Underpass Feasibility study, 2007, by Fukunaga Associates

Table 3-27. Construction Related Jobs and Wages

Approximate Construction Cost[1]	Millions of 2010 $s
Alternative A	
Building Construction	$539.1
Infrastructure	$72.1
Alternative B	
Building Construction	$547.0
Infrastructure	$249.7
Direct Construction Jobs[2]	
Alternative A	
Total (person-years)	2,903
Annual Average, over five years	581
Alternative B	
Total (person-years)	3,784
Annual Average, over five years	757
Indirect and Induced Construction-related Jobs[3]	
Alternative A	
Total (person-years)	3,878
Annual Average, over five years	776
Alternative B	
Total (person-years)	4,840
Annual Average, over five years	968
Wages, in Millions of 2010 dollars[4]	
Alternative A	
Direct Jobs	$185.0
Indirect and Induced Jobs	$162.0
Alternative B	
Direct Jobs	$241.2
Indirect and Induced Jobs	$202.2

Notes

1. Costs are from preceding table. Heavy construction estimated as accounting for 25% of the cost of the VMM and HMLA projects (aprons, other infrastructure) as well as landing zone construction.
2. Job count estimated from 2009 ratio of construction jobs to total construction spending in Hawaii (from excise tax collections), rounded to 4.75 jobs per million $.
3. Indirect and induced jobs estimated using State Input-Output Model direct effects table for wage and salary jobs in construction industries. Multipliers used are for Other buildings (not single-family): 2.37 (including direct, indirect, and induced jobs) and Heavy construction: 2.08.
4. Wages are estimated using 2008 average wages in Construction, escalated to 2010 dollars in line with change in the Honolulu Consumer Price Index.

Sources: State Department of Business, Economic Development and Tourism (DBEDT), 2005 State Input-Output Model (2009); 2009 Hawaii State Data Book (2010); Quarterly State Economic Forecast, Fourth Quarter 2010.

Operations Employment and Wages

Approximately 1,000 Marines would be based at MCB Hawaii Kaneohe Bay, of which approximately 667 would be on island at any given time. The Hawaii Input/Output Model (DBEDT 2009) suggests that military spending generates 0.43 induced jobs for each new direct job, so the total operations employment impact would amount to 667 direct military jobs and 287 induced jobs, for a total impact of 954 jobs.

Marines posted to MCB Hawaii Kaneohe Bay receive pay and a Cost of Living Allowance (COLA). Marines not assigned to quarters on the base also receive BAH. Pay varies not only with pay grade but also with the Marine's length of service. COLA and BAH vary by length of service and the number of dependents. To estimate the impact of these wages and allowances as additions to the local economy, mid-range assumptions were made about length of service, taking into account the average age of Marines at MCB Hawaii Kaneohe Bay in particular pay grades. The wage input could be estimated as:

- Pay and COLA for all Marines in the new units actually on Oahu;
- BAH for all Marines housed on Oahu and for those Marines on UDP who would already qualify for BAH; and
- Pay for Marines on UDP with families on Oahu.

The total direct income impact of the proposed action (Alternatives A and B) would be approximately $42.5 million annually, once the new squadrons have all moved to Hawaii.[39] The 287 induced workers associated with the operational employment would be found throughout the economy. Based on average civilian pay scales, their wages would total approximately $12.5 million annually.[40] The total wage impact on Hawaii for both action alternatives during operations would amount to $55 million per year. With No Action, there would be no new aviation operations and, hence, no wage impacts.

Impact on the Labor Force

Potential impacts on the civilian labor force in Hawaii are due not only to the creation of induced jobs, noted above, but to the arrival of new members of the workforce in military families. Based on recent ACS data for Kaneohe Station, households on the base have, on average, 0.817 civilian workers per household. The family households of new aviation personnel would include some 355 potential workers if this ratio applies to them. The net result would be an increase in the labor force by nearly 70 more potential workers than the jobs created by the proposed action (Alternative A or B). That number is small relative to the regional and island labor force.

In recent years, civilian unemployment in the Kailua/Kaneohe area was very low and at about the same level as the island as a whole. Currently, the Oahu unemployment rate is well below the state and national averages. (For December 2010, the Oahu rate was 4.8 percent, as compared to 5.8 percent for the State of Hawaii and 9.1 percent for the U.S. as a whole.)[41] Even if no additional job openings became available, and the 70 net additional workers associated with the proposed action joined the civilian unemployed, the unemployment rate would change only by a hundredth of a percent. Hence, impacts on the civilian labor force due to Alternative A or B would be minimal. No mitigation is required. Under No Action, there would be no impacts.

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39 Pay scales as of January 2011 were used for these estimates.

40 State of Hawaii, Department of Labor. Average wages for workers on Oahu, 2009 ($42,838), posted at http://www.hiwi.org/gsipub/index.asp?docid=420; adjusted to 2010 in line with annual increase in Consumer Price Index, posted by DBEDT at http://hawaii.gov/dbedt/info/economic/data_reports/info/economic/data_reports/qser/outlook-economy; both accessed in January 2011

41 Rates not seasonally adjusted; from the State Department of Labor and Industrial Relations as of late January 2011: https://www.hiwi.org/admin/gsipub/htmlarea/uploads/LFR_LAUS_Urate_current.pdf

Fiscal Impacts

Much of the impact of a military build-up on local government revenues and costs is difficult to calculate. Marines depend mostly on military facilities and services, not just on civilian ones, so local government costs are not increased simply in proportion to population increases. Also, the federal government provides impact aid, partially offsetting the cost of education for "federally-connected" children. Revenues as well as costs are uncertain. Members of the Armed Forces pay taxes on their basic pay in their state of domicile, which may not be their current residence, to the extent required by state law. BAH and other military allowances are not taxed. Accordingly, the net impact on income taxes is small.

Construction needed to accommodate the new squadrons would generate new revenues for the State of Hawaii. As shown in Table 3-28 the resulting new revenues could total $55 million or more, depending on the alternative. No new revenues would be generated by the No Action Alternative.

Table 3-28. Hawaii State Revenues From Construction Spending for the Aviation Units

	Alternative A	Alternative B
Construction Spending	$611,173,600	$796,655,830
Construction-related Wages	$346,996,901	$443,344,752
Income Taxes		
Corporate Income Tax[1]	$763,967	$995,820
Personal Income Tax[2]	$21,305,610	$27,221,368
Excise Tax (State only)[3]		
On Construction Spending	$24,446,944	$31,866,233
On Spending by Workers[4]	$8,692,504	$11,106,082
Total (income taxes + excise taxes)	$55,209,025	$71,189,503

Notes:

1 Corporate income tax historically averages 0.125% of corporate revenues.

2 Personal income tax historically averages 6.14% of resident incomes.

3 Calculated at 4.166% (not including City and County of Honolulu tax collected along with general excise tax).

4 Calculated for disposable income, estimated from historical data as 62.6% of workers' wages.

Sources: DDBEDT, 2009 Data Book; Department of Taxation 2006, 2008.

Additional local government income could be generated from excise taxes on rents. If the population living outside the base paid an average monthly rent of $1,600 per household, excise taxes on those rents would provide a revenue stream of $444,000 annually to the State of Hawaii (in constant 2010 dollars) and more than $55,000 to the City and County of Honolulu.[42]

While these calculations do not amount to a comprehensive cost-benefit analysis, they show that new construction associated with the aviation squadrons would provide a revenue base that may balance or exceed any long-term costs associated with the increased population on the island.

Community Organization

The new military population, including accompanying family members, would be a small part of the overall community and would have access to Marine Corps facilities and services intended to support military morale and family life and, hence, Marine readiness. With implementation of either Alternative A or B, no impact on the wider community organization or cohesion is anticipated. The No Action Alternative would have no impacts on community organization.

Public Facilities

Schools. If VMM and HMLA squadron members' households are similar in composition to those now living in the Kaneohe Station CDP, they would have the following student population:[43]

Nursery school/pre-kindergarten	52
Kindergarten through intermediate school (K–8)	234
High school	28

Since new households associated with the aviation squadrons are expected to live off-base, Mokapu Elementary School, located on the base, would be affected only by an increase in

[42] Taxes calculated for 587 households. Average rent chosen as rounded average of recent Kailua and Kaneohe CDP rents. Taxes calculated at 4 percent of total rent (State General Excise Tax) and 0.5 percent for City and County of Honolulu additional levy for transit.

[43] Population calculated for 348 households headed by Marines plus 87 households with Marine household heads on UDP; ratio of school population to households from ACS data for Kaneohe Station. Counts include both public and private school students.

requests for Geographic Exemptions. Increases in school populations would be largest in the Kailua area (approximately 77 students in kindergarten through grade 8 in the various Kailua elementary schools and Kailua Intermediate, and nine high school students). Assuming these students are found throughout the Kailua area, not concentrated in a neighborhood like Aikahi Park, the impact of new students on any one school would be small. Moreover, the Kailua and Kaneohe school populations have been declining in recent years, so schools affected by any increase would likely see enrollments below levels recently served. Figure 3-15 shows school enrollment trends for Mokapu Elementary, Aikahi Elementary, and the two intermediate schools in Kailua and Kaneohe. Of the four schools, only Mokapu Elementary continues to serve about as many students as it did in 2003. The other school populations have declined by 20 percent or more since 2003.

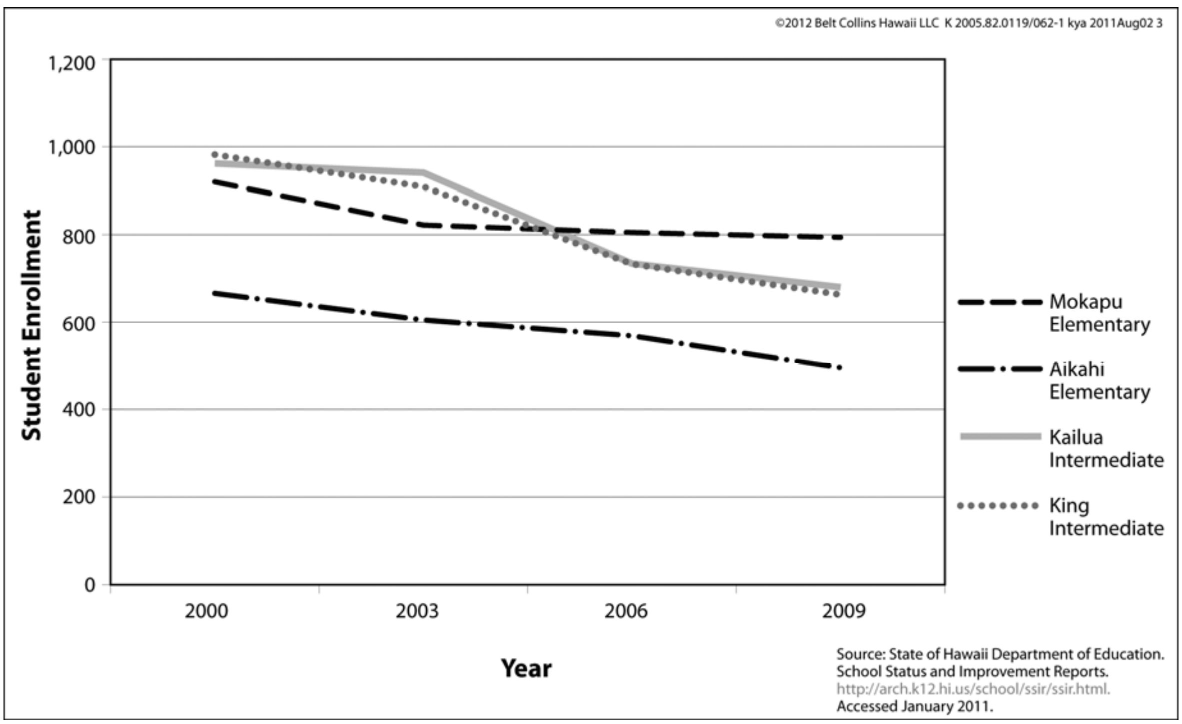

Figure 3-15. Enrollment Trends, Selected Schools, 2000 to 2009

Given recent enrollment trends, the impact of increases in student numbers due to the action alternatives (A or B) is likely to be small for schools in Kailua and minimal for Kaneohe and other locations. No mitigation is required. The No Action Alternative would have no school enrollment impacts.

As noted earlier, the Child Development Centers at MCB Kaneohe Bay increased capacity in 2011. The additional children of pre-kindergarten age associated with the aviation squadrons would live off-base. Some may come to the base for child care; others could receive care in their home areas. There would be little or no impact on pre-kindergarten child care services due to the action alternatives. No mitigation is required. Under the No Action Alternative, pre-kindergarten child care services would not be affected.

Recreation

The new population associated with the squadrons would be able to use Marine recreation facilities as well as public parks and beaches. Increased demand for facilities would be strongest on the base, where the VMM and HMLA personnel—667 at any given time—would increase the Marine population by about four percent. Outside the base, the impact would be dispersed geographically, and the new population would be a much smaller part of the regional and island population using parks and beaches. Impacts on public recreation facilities due to the action alternatives would be minimal; no mitigation is required. With No Action, there would be no impacts on public recreation facilities.

Public Safety and Health Services

Fire Control. New facilities for the aviation squadrons would be designed to limit or control the risk of fire. Crews and fire control personnel at MCAS Kaneohe Bay would be trained to deal with the new aircraft.

Because of the small size of the population arriving with the new aviation units and the low number of buildings to be constructed, no appreciable impact on fire services away from the flight line is anticipated under either Alternative A or B. No mitigation is required. The No Action Alternative would have no effect on fire services.

Police. Because of the small size of the population arriving with the new aviation units, no appreciable impact on police services is anticipated with either action alternative. No mitigation is required. No impacts on police service would occur with the No Action Alternative.

Medical Services. As part of the basing of the VMM and HMLA squadrons, the Aid Station would be expanded for Marine aviators. This would serve existing units as well as the new squadrons.[44] For Marines at MCB Hawaii Kaneohe Bay, the net impact of the proposed action would be an improvement in medical care.

The new population associated with the aviation squadrons would have access to military and civilian medical facilities. Their requirements represent a very small increase in the population using Tripler Army Medical Center and the on-base Naval Health Clinic (approximately 100,000 active duty military, their families, and others) and a smaller share of the user population for civilian medical care. Therefore, impacts on medical services associated with either Alternative A or B would be minimal, and no mitigation is required. The No Action Alternative would have no impact on medical services.

Environmental Justice and Protection of Children

EO 12898, Environmental Justice, February 11, 1994, requires federal agencies to address the potential for disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations. Federal agencies shall ensure that their actions that substantially affect human health or the environment do not directly or indirectly use criteria, methods, or practices that discriminate on the basis of race, color, or national origin. NEPA documents are specifically required to analyze effects of federal actions on minority and low-income populations and, whenever feasible, to develop mitigation measures to address significant and adverse effects on such communities.

Issued in 1997, EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, requires an analysis for children. Federal agencies must identify and assess environmental health risks and safety risks that may disproportionately affect children.

See Section 3.11.2 and Appendix H for data on demographics in the ROI, including race (ethnic composition), age, and economic status of residents (employment status, poverty levels, and income).

The proposed action at MCB Hawaii Kaneohe Bay would not result in disproportionately high health or environmental impacts on minority or low-income populations for two reasons: (1) no adverse impacts on health or the environment have been identified, and (2) the communities surrounding the base are not low-income. Table 3-22 and Figure H-2 in Appendix H show that Native Hawaiians account for a larger share of the population in

[44] An interim consolidated Aid Station for Marine air units will be built. It is an interim facility because it will be replaced by a component of the planned new MAG-24 headquarters.

Kaneohe than in Kailua or the City and County of Honolulu as a whole. However, Figure H-2 in Appendix H shows the ethnic distribution in the Kaneohe school (King Intermediate) to be more diverse than in the Waimanalo school (Waimanalo Elementary and Intermediate). Accordingly, questions of environmental justice per EO 12898 are not raised by either action alternative. No mitigation is required. No environmental justice issues would be raised due to the No Action Alternative.

This EIS identifies no adverse impacts on health and the environment for any population, including children. No disproportionate risks to children are anticipated from either action alternative. The No Action alternative would raise no issues relative to EO 13045 or EO 12898.

Summary

Socio-economic impacts at MCB Hawaii Kaneohe Bay flow from the increase in population associated with the proposed action. The new military and dependent populations would increase demand for housing and public facilities. However, the population increase is small relative to the total population of the affected regions. Moreover, new state tax revenues associated with project construction could offset some of the cost associated with new demand for public services.

Because the number of newly assigned Marines and dependents would be the same for Alternative A and Alternative B, socioeconomic impacts would be the same for these two action alternatives. Under the No Action Alternative, Marine and dependent populations would not change, so there would be no impact.

3.12 INFRASTRUCTURE

3.12.1 ROADWAYS AND VEHICULAR TRAFFIC

3.12.1.1 Introduction

A traffic study assessing traffic impacts resulting from an increase in the number of personnel at MCB Hawaii Kaneohe Bay is included in Appendix I-1 and summarized in this section. Potential impacts on roadways and traffic in the vicinity of the proposed action were analyzed by projecting and evaluating future traffic conditions for the study area to the horizon year 2018. The ROI includes nine major intersections throughout the base, the two entry gates, and the roadways providing access into the base. With no difference in the number of personnel, Alternatives A and B would involve the same increases in traffic volume. A difference in traffic between the alternatives is expected at the runway crossing, with higher volumes under Alternative B, which would site MV-22 hangars, aprons, and other facilities at West Field. In order to determine potential impacts of the proposed action, the following traffic scenarios were analyzed:

- **Existing Conditions (2010).** The analysis of existing traffic conditions provides a basis for the remainder of the study and includes an assessment of baseline traffic volumes and operating conditions.
- **No Action Alternative (2018).** The objective of this scenario is to project future traffic growth and operating conditions resulting from known development projects within the base besides the proposed action.
- **Proposed Action, Alternatives A or B (2018).** The objective of this scenario is to identify potential impacts of the proposed action on future traffic operating conditions at key intersection. The proposed action itself would generate additional vehicle trips, but potential impacts would be minimized with the inclusion of some intersection improvements.

It is noted that the difference between the No Action Alternative and the future with project conditions (Alternation A or B) represents the impacts of the proposed action.

Level of service (LOS) is used to characterize traffic conditions and provide a quantitative measure to describe traffic flow conditions. The LOS methodology is based on the 2000 Highway Capacity Manual (HCM 2000), prepared by the Transportation Research Board. The different levels range from excellent free-flowing conditions (LOS A) to very congested conditions (LOS F). Table 3-29 defines each LOS. The accepted LOS in urban areas is typically considered to be a minimum LOS D.

Table 3-29. LOS Definitions

	Average Delay Per Vehicle	
Level of Service	**At Unsignalized Intersections**	**At Signalized Intersections**
A	Up to 10 seconds	Up to 10 seconds
B	>10 and ≤15 seconds	>10 and ≤20 seconds
C	>15 and ≤25 seconds	>20 and ≤35 seconds
D	>25 and ≤35 seconds	>35 and ≤55 seconds
E	>35 and ≤50 seconds	>55 and ≤80 seconds
F	>50 seconds	>80 seconds

Source: Highway Capacity Manual 2000

Traffic analyses were done for peak hours (those with highest volumes) during the morning (AM), midday, and afternoon (PM). Peak hour volumes that can accommodate the existing or future roadway system means that off-peak volumes would also be adequately served.

Development-related impacts on roadways may vary between the two action alternatives based upon the location of the aviation operations on the base; however, the two alternatives are located in the same region of the base and would utilize the same roadways. Operational impacts at the nine intersections and two gates would be the same for the two alternatives; only the operational impacts at the runway crossing would be different.

3.12.1.2 Affected Environment

The existing (2010) traffic conditions are based on field observations and machine counts conducted over a two-week period in September 2010. The counts were scheduled to avoid special events and were recorded at 15-minute intervals. Figure 3-16, shows the nine manually counted intersections circled in red and one machine count circled in blue on Mokapu Road crossing the runway.

Additional traffic counts collected by the Base Safety Office for the two gates into the base were also reviewed. The main gate ("H-3 Gate") from Interstate Route H-3, which is a four-lane freeway, is normally open 24 hours a day. The Mokapu Gate on Mokapu Road at the east side of the base is only open between 5AM and 10PM. Within the base, Mokapu Road is a two-lane road, but it connects to a four-lane divided boulevard in the Aikahi neighborhood of Kailua.

To evaluate the surrounding roadways just outside of MCB Hawaii Kaneohe Bay, traffic data published by the State of Hawaii Department of Transportation (Highways Division Planning Branch) was used. The daily volume of vehicles on H-3 near MCB Hawaii Kaneohe Bay is 16,000. Based upon the HCM 2000, the capacity of a four-lane freeway is 120,000 vehicles per day. The daily volume of vehicles on Mokapu Road is 6,369, and the capacity of this collector street according to the HCM 2000 is 40,000 vehicles per day.

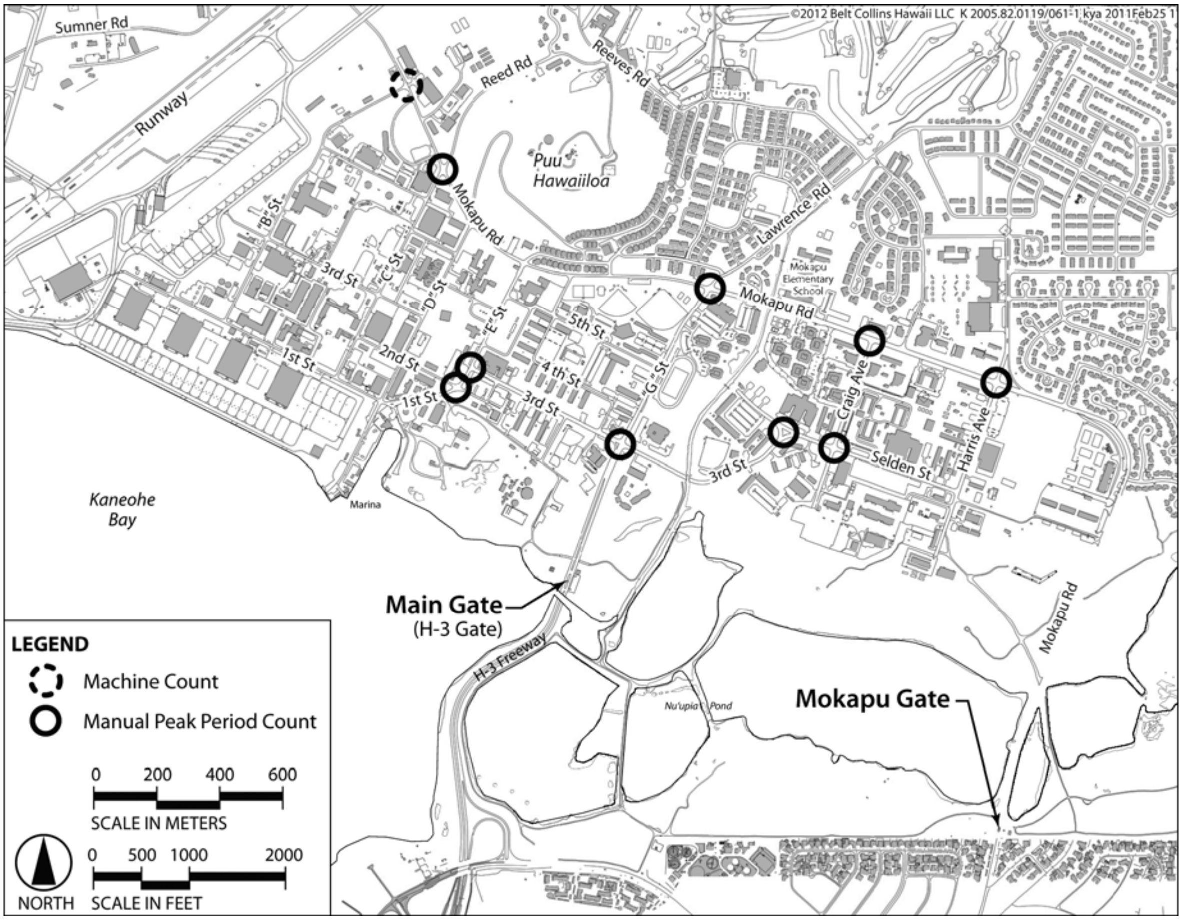

Figure 3-16. Traffic Count Locations

Table 3-30 summarizes the existing (2010) conditions at these intersections during the morning, midday, and afternoon peak hours. The analysis indicates that five of the nine intersections studied operated at LOS E or F during at least one of the peak hours.

Table 3-30. Existing (2010) Conditions LOS

Intersection	Control[1]	AM Peak Hour	Midday Peak Hour	PM Peak Hour
G Street and Third Street	Signal	D	D	D
Mokapu Road and Harris Avenue	Signal	D	C	C
Mokapu Road, G Street, and Lawrence Road	Signal	E	E	E
Mokapu Road, G Street, and Lawrence Road[2]	AWSC	C	C	D
C Street and Reed Road at Mokapu Road	TWSC	B	B	B
Third Street at E Street	TWSC	C	F	D
Second Street at E Street	TWSC	C	D	F
Craig Avenue at Mokapu Road	TWSC	D	E	C
Craig Avenue at Selden Street	TWSC	E	F	C
Selden Street at Third Street	TWSC	D	D	D

Notes:

1 Intersection is controlled by a traffic signal, all way stop controlled (AWSC), or two-way stop controlled (TWSC). For unsignalized intersections the level of service for the worst movement is reported.

2 The traffic signal at this intersection was changed after the traffic count was taken to flash red on every approach, effectively converting this intersection to an all-way stop.

Some short term measures to improve existing conditions were recommended to improve unacceptable intersection service. The following summarizes the improvements:

- At the Mokapu Road, G Street, and Lawrence Road intersection, continue the all-way stop condition and modify the westbound approach to a left turn only lane with a through/right turn lane.
- At the G Street and Third Street intersection, install new pedestrian signal heads and actuators (push buttons) for the south crosswalk, vehicle detectors on the Third Street approaches, and retime the signal operation with an actuated east-west (Third Street) phase for better efficiency.
- At the Second Street and E Street intersection, use the existing west leg as a one-way roadway for westbound traffic, and turn the eastbound traffic on Second Street south to create a new intersection with First Street.
- At the Third Street and E Street intersection, reverse the flow of traffic in the parking lot fronting Building 213 to simplify operations at the intersection. This would change the eastbound approach from a parking lot exit-only to an entrance-only.

- Restripe Mokapu Road from G Street to Harris Avenue from the existing two lanes of traffic in each direction to one lane of traffic in each direction with a median lane that will be available for left turns, and at selected locations, for pedestrian refuge.
- At the intersection of Mokapu Road and Harris Avenue, convert lane assignments.
- At Third and Selden Streets, reconfigure the intersection to a standard "T"-intersection with channelized right turn lanes.
- At Craig Avenue and Selden Street, convert the existing two-way stop to an all-way stop intersection.

3.12.1.3 Environmental Consequences

To evaluate potential impacts of the action alternatives (Alternatives A and B) on the surrounding roadway system, it is necessary to develop estimates of future (2018) traffic conditions in the area both with the proposed action ("Future with Project," i.e., proposed basing of the squadrons and development of facilities to support the squadrons) and under the No Action Alternative ("Future Baseline"). The incremental change in the LOS between future baseline conditions and future project conditions represents the potential impacts of the proposed action. In this analysis, LOS D is considered the minimum acceptable LOS. Project-specific impacts were identified using the following criteria:

No Action Alternative (Future Baseline)	Proposed Action (Future with Project)	Project Impact
LOS D or better	LOS D or better	No
LOS D or better	LOS E or F	Yes
LOS E or F	LOS E or F	No

No Action Alternative Traffic Projections

Future baseline conditions without the proposed squadrons and facilities development were determined by reviewing existing base population data and projections in military personnel expected as part of other actions at the base, including Grow the Force (GTF) Initiatives. At the time of the field surveys, GTF initiatives were underway at MCB Hawaii Kaneohe Bay, but implementation was not fully executed. Projected increases in the de-facto population due to GTF were added to the baseline condition.

The analysis indicates that with implementation of the improvements recommended above, the subject intersections—with one exception, the eastbound approach at the intersection with Craig Avenue and Selden Street—would operate with acceptable conditions for the traffic demands expected under baseline conditions (see Table 3-32). Minor striping improvements are recommended to provide left turn lanes on Selden Street at Craig Avenue to help improve the intersection LOS to acceptable levels.

Alternatives A and B Traffic Projections

Future conditions with the basing of the squadrons and associated development were evaluated to determine the additional population expected on the base. Alternatives A and B are both anticipated to add 1,000 military personnel, 22 civilian employees, and approximately 1,100 military family members, which would increase existing population by around 16 percent. This boost in population would increase traffic volumes on the streets just outside the base. Assuming that a similar 16 percent increase in traffic to H-3 and Mokapu Road is experienced, the net increase in traffic would not be significant because it would not reach the capacity of these roads. No mitigation is required.

An increase in population on the base also means expected increases in traffic at the entry gates. An analysis of vehicle queuing at the gates is shown in Table 3-31. Gate procedures would need to be improved to increase capacity. Existing tandem checking of passes and identification cards by sentries would need to be expanded to three sentries per lane at the H-3 Gate. With implementation of these measures, no significant impacts are expected at the entry gates due to either Alternative A or B.

Table 3-31. Vehicle Queuing at Entry Gates

	H-3 Gate				Mokapu Gate			
Parameter	Volume (veh/hr)	Sentries per lane	Capacity (veh/hr)	Design Queue (# of veh)	Volume (veh/hr)	Sentries per lane	Capacity (veh/hr)	Design Queue (# of veh)
Existing	1,050	2	1,200	40	600	2	720	13
Future Baseline	1,100	2	1,200	47	620	2	720	14
Future with Project	1,250	2	1,200	70	685	2	720	20
Future with Project with mitigation	1,250	3	1,440	45				

Table 3-32 summarizes projected traffic operating conditions for the future (2018) No Action and proposed action conditions at the study intersections during the morning (AM), midday, and afternoon (PM) peak hours.

Table 3-32. Future 2018 (No Action and Proposed Action) Traffic Operating Conditions

Intersection	Control[1]	AM Peak Hour		Midday Peak Hour		PM Peak Hour	
		No Action	Prop Action	No Action	Prop Action	No Action	Prop Action
G Street and Third Street	Signal	C	D	C	C	D	D
Mokapu Road and Harris Avenue	Signal	D	D	D	D	D	D
Mokapu Road, G Street, and Lawrence Road[2]	AWSC	C	C	C	E	C	C
C Street and Reed Road at Mokapu Road	TWSC	B	E	B	E	B	C
Third Street at E Street	TWSC	D	D	C	C	C	C
Relocated Second Street at First Street	TWSC	B	B	C	C	D	D
Craig Avenue at Mokapu Road	TWSC	D	D	C	C	C	C
Craig Avenue at Selden Street[3]	AWSC	D/C	C	D/C	E	C/B	C
Selden Street at Third Street	TWSC	C	C	C	C	C	B

Notes:

1 Intersection is controlled by a traffic signal, all way stop controlled (AWSC), or two-way stop controlled (TWSC). For unsignalized intersections the level of service for the worst movement is reported.

2 The traffic signal at this intersection was changed after the traffic count was taken to flash red on every approach, effectively converting this intersection to an all-way stop.

3 The LOS on the left is based on the existing configuration; the LOS on the right is if the intersection is mitigated to improve the eastbound traffic on Selden Street. For the future with project condition, the mitigated intersection configuration was used to run the LOS analysis.

Analysis of the future under Alternative A or B indicates that three of the nine intersections studied would operate at LOS E or F during at least one of the peak hours without any roadway improvements. The expected increases in traffic due to either action alternative require improvements at the following intersections:

- Widen the eastbound Mokapu Road approach at G Street to provide a separate left and through lane with a channelized right turn lane.
- Widen the southbound Reed Road approach at Mokapu Road to provide an additional right turn only lane.
- Restripe the southbound approach at Selden Street and Craig Avenue to provide a separate right turn only lane.

Table 3-33 summarizes the traffic operating conditions under Alternatives A and B with the mitigated intersection improvements for the three intersections that operated at LOS E or F during at least one of the peak hours.

Table 3-33. Future 2018 With Proposed Action and With Mitigation Traffic Operating Conditions

		AM Peak Hour		Midday Peak Hour		PM Peak Hour	
Intersection	Control[1]	Prop Action	With Mitigation	Prop Action	With Mitigation	Prop Action	With Mitigation
Mokapu Road, G Street, and Lawrence Road[2]	AWSC	C	C	E	D	C	C
Mokapu Road, G Street, and Lawrence Road	Roundabout		C		C		C
C Street and Reed Road at Mokapu Road	TWSC	E	D	E	D	C	C
Craig Avenue at Selden Street	AWSC	C	C	E	D	C	C

Notes:
1 Intersection is all way stop controlled (AWSC) or two-way stop controlled (TWSC).
2 For unsignalized intersections the level of service for the worst movement is reported.

At the Mokapu Road, G Street, and Lawrence Road intersection, an alternate suggestion to improving the all-way stop condition is to provide a compact roundabout configuration with a channelized right turn from Mokapu to Lawrence Road. A compact roundabout is approximately 100 ft (30.4 m) in diameter, whereas a typical urban roundabout is around 120 ft (36.6 m) in diameter. It would require some slight alignment adjustments on G Street and Lawrence Road, but would provide acceptable levels of service for all of the movements, reducing roadway impacts to unsignificant levels. However, this roundabout would require using housing area land and would be more difficult to construct and cost more than widening the eastbound approach.

Projected Impacts on Runway Crossing

Machine traffic counts on Mokapu Road were conducted since traffic is stopped at the approaches to the runway when the runway or parallel taxiways are in use. Traffic signals with lighted gate arms are manually operated to control the flow of vehicles. A sentry is present to ensure that vehicles do not cross the runway/taxiway when the gate arm is lowered.

Under Alternative A, the route crossing the runway would be realigned. Due to this realignment, the route would be slightly longer and thus require more time for vehicles to cross. In addition, the frequency of runway closures would increase due to the new aviation operations. The analysis indicates that delays would increase from 110 to 200 seconds per vehicle with six additional closures of the runway per day. Should there be seven additional closures per day, traffic volume would exceed capacity. The Air Operations Office controls vehicular crossings at the runway and should provide notices to motorists when runway closures are expected to be higher than average.

With the development of MV-22 facilities at West Field under Alternative B, the number of vehicles crossing the runway would increase by three times the existing volume. This alternative includes the construction of the Mokapu Road underpass to help alleviate the volume of vehicles needing to cross the runway. Under this scenario, only very tall vehicles would continue to utilize the at-grade crossing instead of the underpass.

Projected Off-Base Traffic Impacts

Based upon the anticipated housing demand provided in the socioeconomic analysis (Section 3.11), off-base housing demand for both families and bachelor marines would increase by 0.5 percent for Oahu. Windward Oahu would see the largest increase of 3.2 percent; however, this increase would be gradual over time and the amount of housing is not expected to increase significantly. Impacts to the roadway systems coming into and out of the base would not be significant since there is adequate capacity on those existing roadways. Roadway in nearby neighborhoods would see minimal increases in traffic, since most of the marines would be renting already existing housing units. Any new housing developments in the Windward area would most likely have to provide their own traffic impact analyses of the surrounding area.

Summary

In summary, net impacts from the proposed action under Alternatives A or B are not expected to be significant based upon the mitigated intersection improvements and improved efficiency at the entry gates. Delays at the runway crossing under Alternative A should be monitored by the Air Operations Office to ensure that vehicles are notified if above average runway closures are expected. No significant impacts to roadways surrounding the base are expected for either action alternative since there is available capacity to handle the increased traffic. With the No Action Alternative, traffic conditions would change due to other initiatives on the base; with minor improvements, intersections on the base would operate at acceptable levels.

3.12.2 PUBLIC TRANSIT

3.12.2.1 Introduction

This section analyzes effects of the proposed action on public transit service to MCB Hawaii Kaneohe Bay. The number of additional personnel and dependents would be the same for Alternatives A and B; therefore, any public transit impacts would be the same for the action alternatives. The ROI is the entire base.

3.12.2.2 Affected Environment

Public transportation is provided by the City and County of Honolulu Department of Transportation Services (DTS). DTS runs a fixed-route transit system called *TheBus* and a curb-to-curb service for paratransit-eligible individuals called *TheHandi-Van*. TheBus operates about 100 routes, one of which (Route 70) serves MCB Hawaii Kaneohe Bay. The Route 70 bus enters through the Mokapu Gate, travels along Mokapu Road, then makes a loop around Harris Road, Selden Street, 3rd Street, and G Street before ending back on Mokapu Road and exiting the base. Information obtained from DTS notes the average daily boardings of 256 for this bus route. The route provides service between 6AM and 8PM with buses arriving every 60 to 100 minutes. Other routes near the base include Routes 56, 85, and PH5. All persons are required to have valid military identification to enter the base on *TheBus*.

3.12.2.3 Environmental Consequences

Public transit usage is expected to increase with the growth in base population. If bus ridership increases by the same percentage as the projected population (approximately 16 percent), daily boardings would increase to 297, which would not exceed the capacity of the existing system.

Any improvements to service, schedule, and route location would need to be studied and coordinated between the base and DTS. The study would have to determine ridership (frequency, times of day) and whether existing roadways for existing route relocation are sufficient to handle the weight and turning radius of the bus, and whether bus stop requirements meet accessibility standards. DTS would consider adding service to existing routes, provided that (1) all of these issues are studied, (2) demand warrants an increase in bus service, and (3) the City's budget is adequate to provide additional service.

Summary

The increase in base population in Alternatives A and B would result in an increase in bus ridership. The bus system has sufficient capacity to accommodate this growth; no mitigation is required. For the No Action Alternative, there would be no change and therefore no impact.

3.12.3 POTABLE WATER

3.12.3.1 Introduction

This section addresses potential impacts on water systems serving the base. The water system analysis for projected base water usage due to the proposed action is presented in Appendix I-3. MCB Hawaii Kaneohe Bay is supplied with potable water from the Honolulu Board of Water Supply (BWS) system. A base distribution and storage system supplies potable water within the installation. Potable water use for golf course irrigation is supplemented within system limitations with treated base wastewater.

The extent of impacts would be related to (1) projected increases in base and off-base water usage due to incoming military personnel and family members that would place increased water supply requirements on the BWS Kailua-Kaneohe regional water system, and (2) identification of a need to construct new system facilities. The primary ROI includes Windward Oahu communities served by the BWS system, as described below. The entire island of Oahu is considered the overall ROI, since it is assumed that approximately 44 percent of personnel from the VMM and HMLA squadrons living off-base would occupy housing outside of Windward Oahu.

Development related impacts for on- and off-base potable water systems would not vary for the two action alternatives since potable water usage is population based, which is the same for each alternative. Fire protection and other water usages would be essentially the same.

3.12.3.2 Affected Environment

Existing Water Systems

BWS supplies water to the base via a 20-in (0.5-m) main at the back gate at Mokapu Road. This main is part of the BWS Windward Oahu system that services the region from Waimanalo to Ahuimanu, and is interconnected with the water system from Waihee to Punaluu. Service to the base is primarily from the 2.0-million gallon (mg) Kapaa reservoir tank. This tank is part of the same water service pressure zone with four other Kailua area tanks totaling 11.3 mg and two Kaneohe/Ahuimanu tanks totaling 3.0 mg. Water source is an array of seven wells and three tunnels in Kaneohe to Kahaluu, and another 18 wells and one tunnel from Waihee to Punaluu.

The water entering the base is chlorinated and fluoridated. Pumps boost water pressure for the base system when necessary due to inadequate pressure from the BWS system and during emergencies. Ground level tank reservoirs with a total storage capacity of 3.2 mg service the base for domestic and fire protection use. A series of water mains of various sizes connects the BWS supply to the tanks and to the various base facilities.

The base's contract agreement with BWS does not specify a limit for the amount of water that the base may draw from the BWS system. The 20-in (0.5-m) supply main has a capacity of 7.0 to 7.5 mgd (million gallons per day).

Existing Base Water Usage

Annual average day water usage at MCB Hawaii Kaneohe Bay, based upon FY07 thru FY10 monthly water usage data, is about 2.0 mgd. Annual maximum day demand is 4.0 mgd.[45] Daily historical data is provided in Appendix I-3.

Several key factors influence normal and current water usage. Current usage data reflects the use of potable water to replace the temporary suspension of 0.5 mgd of wastewater reuse for golf course irrigation. A multi-year family housing reconstruction program is rebuilding units in phases. A number of units are out of use at any time, thus reducing water usage. Water use also varies with deployments of Marine Corps units.

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[45] Based upon 2.0 maximum day to average day factor, UFC 3-230-19N, Water Supply System.

3.12.3.3 Environmental Consequences

Projected Base Water Usage

With introduction of the VMM and HMLA squadrons (Alternatives A and B), total projected water usage at MCB Hawaii Kaneohe Bay is estimated at 2.094 mgd for the annual average day demand and 4.19 mgd for the annual maximum day demand. Compared to existing usage, this is a 4.7 percent increase in water use at the base, which is conservatively high due to the analysis basis used, giving a good indication of the existing system adequacy. With the No Action Alternative, there would be no additional water requirement.

A number of factors would contribute to reduced base water usage in the future. These include programs to reduce water consumption and to conserve water. Replacement and renovated family housing and other facilities are being fitted with low flow water fixtures. Metering and user payment for utility usage will encourage occupants to reduce consumption.

Projected Off-Base Water Usage

As indicated in the socioeconomic analysis in Section 3.11, new off-base housing demand for both families and bachelor marines would increase by about 0.5 percent for Oahu, including an increase of 3.2 percent for Windward Oahu. With the Kailua-Kaneohe regional population projected to slightly decrease for 2000–2010, and projected population to be essentially unchanged for the next decade, impacts to the BWS water system would be negligible.

BWS Supply to the Base

The BWS system allowance of over 7.0 mgd for the base is adequate to meet the projected maximum day demand of 4.19 mgd. The BWS system has adequate capacity to accommodate the projected increase in water usage, an estimated 0.094 mgd for the annual average day for both Alternative A and Alternative B. The 4.7 percent water usage increase is conservative, considering the limited net on-base population of less than 3 percent.[46] Wastewater effluent reuse can be doubled to 1.0 mg per day with improvements to the base's Water Reclamation Facility (WRF) treatment processes. Further reuse is possible. This would replace the use of potable water and more than offset increases to base potable water use due to the proposed action.

[46] Net base resident population increase for the proposed action is 244 bachelor junior enlisted marines occupying the additional billeting spaces to be constructed, compared to 2,044 current spaces available, and no additional families for the proposed action living on-base, with a base inventory of 2,592 housing units by FY2014.

No additional BWS improvements would be necessary to support either Alternative A or B. No mitigation is required. The No Action Alternative would have no impact on the BWS water systems.

Base Water System

Alternatives A and B are expected to have minimal impact on the base water system. No major base system improvements are needed in addition to the on-site improvements to be constructed as part of various projects supporting the proposed action. The No Action Alternative would have no impact on the base water system.

Existing storage volume of 3.2 mgd is more than adequate to meet overall base storage requirement of 1.0 mg per Navy criteria. Storage requirements are generally less for fire protection of special high demand facilities such as aircraft hangars and warehouses. Fire protection systems for an existing aircraft hangar being renovated and new hangars to support the proposed action would be accommodated by on-site storage and pumps.

The various projects proposed as part of the action alternatives include distribution system improvements necessary to meet water supply demand. Fire flow analyses performed on February 1, 2011 at Fire Hydrants K17FH09 and L17FH01 indicate that the existing fire hydrants would meet minimum required service and fire flow rate requirements, except for selected facilities such as aircraft hangars that have unusually high flow requirements. Project designs would determine fire protection and domestic flow needs (rate and pressure) and system improvements required to satisfy these requirements. Additional fire protection provisions such as local storage tanks and fire pumps would be provided for projects that need them.

Summary

In summary, potential impacts to water systems from projected increases in on-base and off-base populations and the related water usages due to implementation of Alternatives A or B would be minimal. No mitigation is required. The No Action Alternative would have no effect on water systems.

3.12.4 WASTEWATER SYSTEM

3.12.4.1 Introduction

This section addresses impacts on the wastewater system serving the base, including the City's Kailua regional wastewater treatment plant. The extent of impacts would depend upon the projected increase in the amount of wastewater generated that would, in turn, increase the amount of solid and liquid waste discharged, and the capacity of the existing system to accommodate the increased volume. The base wastewater system analysis is provided in Appendix I-4. The primary ROI includes Windward Oahu communities served by the C&C system, as described below. The entire island of Oahu is considered the overall ROI, since it is assumed that approximately 44 percent of personnel from the VMM and HMLA squadrons living off-base would occupy housing outside of Windward Oahu. As for potable water, development related impacts for wastewater systems would not vary between the two action alternatives.

3.12.4.2 Affected Environment

Existing Wastewater Systems

MCB Hawaii Kaneohe Bay has its own wastewater (sewage) collection and treatment system. The base sewage system includes a network of 6- thru 30-in (0.8-m) gravity mains and a number of pump/lift stations and force mains. Sewage flows to the base WRF (wastewater reclamation facility) for secondary level treatment, with treated effluent discharged to the City's Kailua regional wastewater treatment plant complex for disposal thru an ocean outfall system. Cesspools and septic tank systems serve outlying areas of the base that are not affected by the proposed action.

The WRF capacity is 2 mgd. A contract agreement with the City allows 450 mg of discharge annually (equivalent to 1.23 mgd) to the City ocean outfall. There is no restriction on the discharge volume. Part of the base-treated effluent is used to irrigate the base golf course, although this reuse has been suspended since late 2009 until repairs at the WRF are completed in 2011. Golf course reuse is now limited to about 0.50 mg due to State restrictions of reuse for the level of treatment now provided by the WRF.

The Kailua plant processed 11.26 mgd in 2010. Base treated effluent by-passes the Kailua plant treatment processes. Treated effluent from the base WRF and from the Kailua plant are discharged via a pump station and a 48-in (1.2-m) diameter deep ocean outfall to 5,083 ft (1,549 m) offshore at a depth of about 110 ft (33.5 m). .

Existing Base Wastewater Discharge

Wastewater flow data for FY07 thru FY10 at MCB Hawaii Kaneohe Bay show the following annual average day treated effluent discharges: 1.21 mgd for FY07; 1.22 mgd for FY08; 0.99 mgd for FY09; and 1.03 mgd for FY10. An annual average day discharge of 1.22 mgd is used for evaluation of the existing system. It is noted that data limitations exist due to suspension of treated effluent reuse, family housing units currently being reconstructed, and Marine deployments. The 1.22 mgd is based upon no reuse of treated effluent.

3.12.4.3 Environmental Consequences

Projected Base Wastewater Discharge

Projected annual average day sewage discharge based upon the 4.7 percent increase assumed for the water system analysis is 1.28 mgd. This projection is considered conservatively high. The projected average day discharge of 1.28 mgd exceeds the 1.23 mgd per the contract with the City. There is no restriction on the annual discharge. Furthermore, the projected increase in discharge due to the proposed action is considered a high conservative estimate. Actual discharge off base is expected to be lower by about 0.50 mgd due to resumption of golf course irrigation using treated effluent once WRF repairs are completed.

Alternatives A and B would increase the base average day discharge for the ocean outfall by 120,000 gallons per day assuming no on base treated effluent reuse. The projected average day outfall discharge would increase to 12.48 mgd. This is an increase in ocean discharge of less than one percent. The discharge is permitted and meets discharge standards and criteria. Net impacts to the ocean environment for this level of discharge are expected to be negligible.

Projected Off-Base Wastewater Discharge

The off-base residential population increase by about 500 families plus an additional 300 single Marine Corps personnel would be dispersed to the Kailua–Kaneohe region as well as other areas on Oahu. These additional off-base residents are expected to occupy existing housing inventory and would be a small percentage increase to any locality.

Wastewater Systems

Improvements to the base's WRF treatment processes to meet higher State reuse standards would allow greater irrigation reuse of treated effluent. Golf course irrigation alone could potentially use up to 1.0 mgd or double the current practice of reusing 0.5 mgd of treated effluent. Other reuse of treated effluent would further reduce ocean discharge.

Summary

In summary, potential impacts to wastewater systems from projected increases in on-base and off-base populations due to implementation of Alternative A or B would be minimal. The net impacts are expected to be similar or less than those noted for the water system. No mitigation is required. The No Action Alternative would have no effect on wastewater systems.

3.12.5 SOLID WASTE DISPOSAL

3.12.5.1 Introduction

This section addresses impacts of solid waste generated due to increases in population and activities. As the increase in population and activities on the base would be the same under Alternatives A and B, solid waste impacts would be the same for the two action alternatives. The extent of impacts would depend on the capacity of the on-base, City and County, and private solid waste facilities, as well as recycling of base solid wastes. The ROI is potentially islandwide, given the use of landfills serving the entire island.

3.12.5.2 Affected Environment

On-Base Solid Waste Disposal

MCB Hawaii Kaneohe Bay operates the MCB Hawaii Kaneohe Bay Sanitary Landfill under permit no. LF 0034-07, issued by the State DOH. Solid waste materials sent to this landfill include trash/industrial waste from offices/barracks and other work areas, and wastewater treatment plant sludge. The total solid waste received at the base landfill from July 2009 to June 2010 was 2,570 tons. The computed volume of material added to the landfill from June 30, 2009 to June 10, 2010 was 21,560 cubic yards. Material diverted from the waste stream via on-site recycling programs from July 2009 to June 2010 included approximately 4,468 tons of materials.

The MCB Hawaii Kaneohe Bay Sanitary Landfill is located on the south slope of Ulupau Crater and has a projected capacity of 1,204,000 cubic yards based on a final grading plan prepared by Hawaii Pacific Engineers, dated April 1999. As of July 1, 2010, the computed remaining volume of material (airspace) is 693,800 CY, for a projected remaining landfill life of 48 years.

MCB Hawaii Kaneohe Bay has established waste management procedures to assure compliance with federal and state laws and regulations, and to maximize the life of the MCB Hawaii Kaneohe Bay Sanitary Landfill. Base Order 5500.15B, Chapter 3, Base Regulations, Litter and Trash Disposal, states that recyclables, wood, metal, hazardous waste, materials that present a potential explosion hazard, tires, and government issued appliances and televisions are not allowed in dumpsters. Base solid waste management programs include recycling, landfill screening, material reuse, and waste diversion.

Recycling programs at MCB Hawaii Kaneohe Bay divert a significant amount of material (4,468 tons compared to 2,570 tons deposited at the base landfill for July 2009 to June 2010) from the waste stream. Base Order 4500.2 requires that all units and activities participate in the base Qualified Recycling Program, where all recyclables collected at each unit are brought to the MCB Hawaii Recycling and Reuse Center. Usable but unwanted materials are also turned in to the Recycling and Reuse Center for redistribution.

Waste screening and diversion result in the removal of wood, pallets, recyclables, hazardous wastes, and reusable items from the waste stream. Crushed concrete, asphalt, and coral are stockpiled for reuse. Construction debris is reused where appropriate. Plastic waste not suitable for recycling is diverted to the City's H-POWER waste-to-energy facility. Usable wood is screened from loads destined for the landfill and reused for official and personal use. Other usable wood are ground into chip for trail dressing and weed abatement uses.[47]

The 2009/2010 Annual Operating Report for the MCB Hawaii Kaneohe Bay Landfill, dated July 28, notes that all industrial hazardous materials issued to base activities are bar coded and tracked by the base Hazardous Minimization (HAZMIN) Center. Materials that need to be disposed of as hazardous waste or universal waste are disposed of at the base hazardous waste 90-day accumulation site.

Off-Base Solid Waste Disposal

Solid wastes generated from MCB Hawaii Kaneohe Bay family housing areas are handled by a contractor and disposed of off-base at the H-POWER facility and the Waimanalo Gulch Landfill. These facilities serve the entire island of Oahu. The H-POWER facility and Waimanalo Gulch Landfill are located in Leeward Oahu. The total municipal solid waste handled by H-POWER and the landfill is 3,030 tons per day. H-POWER is currently operating at capacity, receiving 1,640 tons per day of combustible waste. Excess solid waste and solid waste not compatible for use as fuel at H-POWER, including commercial waste, bulky waste, and other municipal solid waste, are sent to the Waimanalo Gulch Landfill (City 2008).

The Waimanalo Gulch Landfill, currently the only permitted municipal solid waste (MSW) landfill operating on Oahu, receives approximately 930 tons of municipal solid waste per day and approximately 460 tons of ash and residue per day from H-POWER. H-POWER capacity is being increased by about 50 percent, which will reduce the amount of solid waste that will be diverted to the landfill.

Other material disposed of off-base includes solid waste from various construction/ demolition projects. This material is sent to the PVT Landfill (private) in Nanakuli, on the

[47] MCB Hawaii, Installations, Environment and Logistics Directorate, Environmental Compliance and Protection Department, Solid Waste Management website and FY2003 Secretary of Defense Environmental Security Award Submission Environmental Quality (Non-Industrial Installation), MCB Hawaii.

leeward side Oahu. The PVT Landfill is permitted to accept only construction and demolition debris. It accepts approximately 200,000 tons of material per year. A portion of the waste is sorted and recycled. Life expectancy of the PVT Landfill is anticipated to be 10 to 15 years, which is dependent on the quantity of construction activities in the near future.

3.12.5.3 Environmental Consequences

On-Base Solid Waste Disposal

Projected solid waste to be received at the MCB Hawaii Kaneohe Bay Sanitary Landfill due to the action alternatives would be an estimated 260 tons or 2,600 cubic yards per year. The projection is based on increases for the proposed action of 277 military personnel living on base in the BEQs and approximately 720 military personnel living off base but working on base.

The MCB Hawaii Kaneohe Bay Sanitary Landfill has adequate capacity to handle the projected increase from the proposed action (Alternatives A and B). Based on the approximate 3,030 tons per year of solid waste diverted to the landfill, the 260 tons per year represents a nine percent increase in solid waste disposal, which is considered conservatively high since most of the personnel from the new squadrons would live off-base. The projected landfill life would be on the order of 35 to 40 years, as compared to the current 48-year estimate. As such, the landfill life should be adequate for the foreseeable future, and no mitigation is required. With the No Action Alternative, there would be no impacts on the base landfill.

EO 13514 requires that at least 50 percent of non-hazardous solid waste be diverted from the MCB Hawaii Kaneohe Bay Sanitary Landfill. Current recycling programs at MCB Hawaii Kaneohe Bay divert approximately 4,468 tons of material from the waste stream; anticipated solid waste to be deposited at the base landfill would be on the order 2,830 tons per year. As a result, additional mitigation measures for implementation of EO 13514 are not anticipated.

In addition to the existing base solid waste management programs, the design of sustainable facilities should reduce on-base solid waste generation.

Off-Base Solid Waste Disposal

Projected solid waste from the action alternatives to be received at the H-POWER waste-to-energy facility and Waimanalo Gulch Landfill is estimated at 3,130 tons per year (approximately 9 tons per day). The projection is based on a solid waste generation rate of two tons per capita per year. Approximately 3,030 tons of solid waste per day is received at these facilities from the entire island. The nine tons per day represent a 0.3 percent increase in solid waste disposal. Included in the 0.3 percent increase is ash generated by H-POWER taken to the landfill. Increase in H-POWER capacity would significantly decrease the solid waste being diverted to the landfill. Therefore, impacts of Alternatives A and B would be minimal. No mitigation is required. With the No Action Alternative, there would be no impacts on the City's solid waste disposal facilities.

With the majority of the additional population due to the new squadrons living off base (see socioeconomic analysis in Section 3.11), the proposed action would increase new housing demand by about 0.5 percent for Oahu. New demand for housing is expected to develop over time as the squadrons arrive at MCB Hawaii Kaneohe Bay. The City and County's projections for new housing units indicate that the Windward Oahu housing supply would grow by 1,800 units between 2010 and 2020. Based on these projections, solid waste generated off-base due to the proposed action would be included in that for existing housing units and already planned developments. As such, off-base impacts would be minimal. No mitigation is required for either Alternative A or B. There would be no impacts on off-base solid waste disposal facilities under the No Action Alternative.

Projected solid waste from the action alternatives A and B to be received at the PVT Landfill are estimated at 3,400 and 3,500 tons, respectively, for the entire construction period. The estimate is based on a generation rate of three pounds of construction waste per square foot for construction activities. As indicated above, construction activities under action alternatives A and B would send approximately 3,400 and 3,500 tons, respectively, of construction and demolition debris to the PVT Landfill. Assuming a conservative rate of 1,000 tons per year, the increase in solid waste disposal due to either Alternative A or B at the PVT Landfill would be 0.5 percent of the 200,000 tons of material presently being disposed of annually at the Landfill. No significant impacts are expected and no mitigation is required. With No Action, there would be no impact on the construction and demolition landfill.

Summary

In summary, potential solid waste impacts from projected increases in on-base and off-base populations due to implementation of Alternative A or B would be minimal. Ongoing base solid waste management programs would continue to divert solid wastes away from the MCB Hawaii Kaneohe Bay Sanitary Landfill. Similar programs emphasizing recycling and solid waste diversion are being implemented at other Hawaii military installations and by the State, the City, and the private sector. The increase of H-POWER capacity would reduce the amount of solid waste being diverted to the Waimanalo Gulch Landfill. With these initiatives, there would be no significant effects from on-base, regional, and island-wide development on solid waste disposal facilities. The No Action Alternative would have no effect on solid waste disposal.

3.12.6 ELECTRICAL SYSTEM

3.12.6.1 Introduction

This section addresses potential impacts of the alternatives on electrical systems, both on-base and off-base. No difference in impacts is expected between Alternatives A and B since the number of personnel and dependents, as well as the operations at the base, would be the same. The extent of impact would depend on the capacity of electrical systems to accommodate the new squadrons. The primary ROI includes surrounding Windward Oahu communities served by the HECO system. The entire island of Oahu is considered the overall ROI, since it is assumed that approximately 44 percent of personnel from the VMM and HMLA squadrons living off-base would occupy housing outside of Windward Oahu.

3.12.6.2 Affected Environment

HECO provides power to the base, as well as to the entire island of Oahu. Main service to the base is via two 46-kilovolt (kV) transmission lines to the HECO Mokapu substation near the H-3/main gate with three transformers. The incoming voltage is stepped down to 11.5 kV and fed to the base main substation at Building 5092. Power is then distributed by the base electrical system via three substations at Buildings 1125, 820, and 5033.

Monthly electrical usage data for FY08 to FY10 provided by the base show the following:[48]

FY08	114,805 MWH annual	313 MWH average day
FY09	107,069 MWH annual	293 MWH average day
FY10	107,155 MWH annual	294 MWH average day

The annual average day energy usage is based upon varying days for each year vice 365 days/year.

3.12.6.3 Environmental Consequences

A preliminary base electrical system assessment was conducted by MCB Hawaii Kaneohe Bay to determine what needs to be done to meet increased electrical demand by planned activities and new facilities development. This assessment projects loads to base electrical facilities and off-base HECO systems.[49] The requirements for the action alternatives along with other

[48] Data provided by MCB Hawaii Kaneohe Bay Facilities Department.

[49] Data provided by NAVFAC Hawaii Public Works, March 2011

planned actions at the base are included in the new loads analyzed in the assessment. Key preliminary findings from the analysis are as follows:

- The base's primary distribution system is reliable and effective.
- HECO service to the base is adequate to meet planned future needs. Base peak load demand of 19.36 megavolt amperes (MVA) occurred in November 2009. Worst case maximum development is expected to increase total base demand by 8 MVA to 27.36 MVA. HECO's Mokapu substation transformer servicing the base has a capacity of 37.5 MVA.
- The three main service transformers at the three substations that service the base are adequate; however, load shifts are needed to keep all transformers within rated capacities.
- Changes and upgrades to various feeders are needed to shift and balance loads, to include installing new conductors in existing ducts and additional double circuiting lines.

The various changes and upgrades needed are being incorporated into various projects, including those intended to support the proposed action.

Base energy consumption is expected to increase due to new aviation units and new facilities being developed. The increase is expected to be mainly for the MV-22 aircraft hangar and maintenance facilities. Other proposed projects are mainly renovations and replacement/reconstruction of existing facilities. These projects are expected to result in minimal overall changes to base energy consumption. The MV-22 hangar is programmed for construction at 139,000 square feet (12,922 square meters). Using a 7.5 watt/square foot electrical power demand per Table 810-1 of UFC 2-000-05N (UFC 2005), and assuming eight-hour work days, five work days/week, and 80 percent usage factor, the hangar energy usage would be 4,768 kilowatt hours per day. This is a 1.6 percent increase to the current base annual average day consumption of 294,000 kilowatt hours. With energy reduction and renewable energy measures incorporated into the projects, energy usage would be less. Thus, expected electrical energy usage due to the proposed action is expected to increase current overall base electrical usage by less than 1.6 percent.

Projects supporting the proposed action would implement design practices to meet DoN energy policy/program to conserve energy. Energy use reduction and conservation is mandated by EO 13423, Strengthening Federal Environmental, Energy and Transportation Management, and EISA 2007. Design practices for sustainable facilities focus on reduction in energy use. Photovoltaic electrical generation systems are planned for a number of large facilities such as hangars and warehouses. The specific quantifiable effects of these practices on limiting energy load increases would be determined based on the designs implemented and actual operational experiences for the proposed projects. These measures are expected to significantly reduce energy usage by new facilities over conventional design/construction practices.

Summary

Impacts on electrical systems due to Alternative A or B would be negligible. The electrical load increases are small considering HECO system's ability to provide power to the base. Impacts from additional military personnel and families residing off-base would also be negligible given the assumptions explained in the above sections. No mitigation is required. No impacts are expected with the No Action Alternative.

3.12.7 TELEPHONE AND CABLE

The base communication systems and off base systems would be assessed and upgraded as needed by the military construction projects proposed as part of the proposed action. Needed communication system improvements would be incorporated into the planned facilities, including new BEQs. The increase in cable TV and other communication facilities serving additional BEQ units would be minimal. (The proposed action does not include additions to base family housing.) With the same proposed increases in population and operations, Alternatives A and B would have the same communication service requirements. No significant impacts relating to communications would be associated with either action alternative. No mitigation is required. The No Action Alternative would not affect communications on the base.

3.13 ENERGY USE

3.13.1 INTRODUCTION

This section addresses potential impacts on the base's overall energy consumption. With the same proposed increases in population and operations, Alternatives A and B would have the same energy requirements. The following are key federal government directives on energy use, including energy reduction and conservation:

- EO 13514, Energy Efficiency and Energy Consumption, October 2009
- EO 13423, Strengthening Federal Environmental Energy and Transportation Management, 2007
- Energy Independence and Security Act (EISA) of 2007, January 2007 (P.L. 110-140)

- Energy Policy Act (EPACT) of 2005
- EO 13123, Greening the Government through Efficient Energy Management, 1999

Energy reduction goals have been established for specific periods and are being implemented through Navy and Marine Corps policies and programs. The U.S. Marine Corps Expeditionary Energy Strategy announcement in March 2011 summarizes overall goals and objectives and accomplishments to date to reduce energy intensity, reduce water consumption, increase alternative energy, and reduce non-tactical petroleum use (see Section 5.3.11 in the Cumulative Impacts section for more details).

The Energy Policy Act of 2005, Section 109, directs new federal buildings to be designed 30 percent below American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) standards and calls for application of sustainable design principals.

Military construction projects are implementing Leadership in Energy and Environmental Design (LEED) requirements on many FY2013 and beyond projects. UFC 4-030-01 (UFC 2007) specifies LEED Silver-level rating as the minimum goal for new and renovated building projects. LEED reduces overall energy through various measures, including the following:

- Reduced potable water usage for landscaping and building mechanical systems, which reduces energy use related to water supply, treatment, and distribution, as well as wastewater collection/treatment/disposal. Treated wastewater reuse by the base will contribute significantly to reduction in potable water usage.
- Reduced HVAC[50] energy use by increased insulation of building envelopes (roofs, walls, and windows) to reduce air conditioning loads.
- Reduced HVAC energy consumption by more efficient and effective mechanical systems and monitoring/controls.
- Reduced electrical energy consumption through use of efficient lighting, electrical motors/controls, etc.
- Use of renewable energy such as solar hot water and solar power generation (photovoltaic [PV]) systems.

The ROI for energy use is island-wide. Developmental impacts on energy use would be the same between the two action alternatives since there would be no difference in energy usage.

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[50] Heating, ventilating, air conditioning

3.13.2 AFFECTED ENVIRONMENT

The implementation of energy conservation and reduction programs impacts military energy use on the base and island-wide. The affected environment is the island of Oahu, and includes the public utilities that generate and distribute power, supply water, and treat and dispose of sewage effluent. See Section 5.2.2 in the Cumulative Impacts chapter for a description of renewable energy initiatives by HECO, the State, and others.

MCB Hawaii Kaneohe Bay has a long history of energy conservation. Since 1997, the base has been implementing conservation projects to reduce energy intensity, prior to EISA, EPACT, and the EOs referenced above. This resulted in an already low energy intensity for the 2003 baseline for energy conservation goals. In order to reach the targeted 30 percent energy intensity reduction goal by 2015, MCB Hawaii Kaneohe Bay needs to have a 5.8 percent energy intensity reduction every year from now to 2015. By implementing energy conservation projects, the base is currently reducing its energy intensity by an average of approximately one percent per year.

3.13.3 ENVIRONMENTAL CONSEQUENCES

Future construction projects are required to meet LEED Silver standards or better; the proposed projects being evaluated in this EIS would comply with this LEED goal. With current and planned energy conservation measures implemented through 2015, including those associated with the proposed action (for example, incorporating roof-top solar thermal and/or photovoltaic technologies into new buildings and major renovation projects), MCB Hawaii Kaneohe Bay anticipates being able to reduce energy intensity from the 2003 baseline by a total of 15.5 percent. However, without the implementation of the proposed VMM/HMLA projects (No Action Alternative), energy intensity reduction is expected to be 12.5 percent. No negative impact on energy intensity is anticipated; no mitigation is proposed.

Existing energy conservation programs with broad coverage would be continued and would apply to the proposed action, contributing to minimizing impacts on energy use. These programs include:

- Metering of buildings to monitor and bill for water usage.
- Metering of buildings to monitor and bill for electrical consumption.
- Implementing LEED.
- Energy projects to upgrade older, less energy-efficient facilities.
- Waste minimization and recycling programs.
- Education programs for energy awareness and conservation of resources.

- Review of operational efficiency and management.
- Collaboration with industry, state and county agencies, and public utilities.

Summary

No negative impacts related to energy intensity are anticipated with Alternative A or B. No change would occur with the No Action Alternative. No mitigation is required for any of the alternatives beyond implementation of planned base energy conservation programs and measures.

CHAPTER 4

Other Training Areas Affected Environment and Environmental Consequences

CHAPTER 4

Other Training Areas Affected Environment and Environmental Consequences

4.1 INTRODUCTION

Chapter 4 presents an analysis of the training activities associated with the proposed action and alternatives, to occur at training areas other than Marine Corps Base (MCB) Hawaii Kaneohe Bay. The analysis reflects Marine Medium Tiltrotor (VMM) and Marine Light Attack Helicopter (HMLA) squadrons use at existing training areas in the state of Hawaii. Training activities and proposed construction/improvements at these other training areas would be the same under Alternative A and Alternative B. Under the No Action Alternative, the Marine Corps would continue its existing training operations at these areas.

Construction of improvements to training facilities would only occur at Marine Corps Training Area Bellows (MCTAB), Pohakuloa Training Area (PTA), and Molokai Training Support Facility (MTSF), and are largely focused on making facilities adequate for use by the MV-22. At MTSF, which may be used by the Marine Wing Support Detachment (MWSD), improvements may include clearing, grubbing, grading, paving, and fencing. Table 4-1 provides a comprehensive list of the training areas and identifies the construction/improvements where proposed.

Table 4-1. Summary of Proposed Training Areas and Construction

Island/Training Area	Location of Proposed Construction	Description of Construction/Improvement	Approximate Area
Oahu			
MCTAB	Gull	Reinforce concrete	1,110 SY
“	Hawk	Reinforce concrete	1,110 SY
“	Owl	Reinforce concrete	1,110 SY
“	Noni	Reinforce concrete	1,110 SY
Oahu Training Areas -SBER	(No construction proposed)		
Oahu Training Areas –KTA and KLOA	(No construction proposed)		
Oahu Training Areas –DMR	(No construction proposed)		
Hawaii			
PTA	Bravo	Expand existing helipads	15,000 SY
Kauai			
PMRF	(No construction proposed)		

Table 4-1. Summary of Proposed Training Areas and Construction

Island/Training Area	Location of Proposed Construction	Description of Construction/Improvement	Approximate Area
Molokai			
MTSF	Vacant	Clearing, grubbing, grading, paving, and installation of fencing	2,220 SY
Kalaupapa Airport	(No construction proposed)		
Maui			
HIARNG	(No construction proposed)		

SY – square yards
mi – miles
MCTAB – Marine Corps Training Area Bellows
WAAF – Wheeler Army Air Field
SBER – Schofield Barracks East Range
KTA – Kahuku Training Area
KLOA – Kawailoa Training Area
DMR – Dillingham Military Reservation
PTA – Pohakuloa Training Area
MTSF – Molokai Training Support Facility
HIARNG – Hawaii Army National Guard

Potential operational impacts from aviation training at the areas listed above are evaluated and identified in Chapter 4. All of these training areas are routinely used by the Marine Corps, with the exception of the inactive MTSF and the Hawaii Army National Guard (HIARNG) facility. Training activities are described in Section 2.4.2.2. Further details of typical flight operations of the MV-22 and UH/AH-1 aircraft are presented in Appendix C-1, Flight Operations. Aerial images of each location proposed for training are shown in Appendix B.

Chapter 4 is organized by the following issues or resources:

- Land use
- Airspace
- Air quality
- Noise
- Geology, soils, and topography
- Drainage, hydrology, and water quality

- Biological resources
- Cultural resources
- Safety and environmental health
- Socioeconomics
- Infrastructure (no additional infrastructure)
- Energy use

Within each issue or resource section, descriptions of the affected environment and environmental consequences are presented for each training area. The methodology and the regulatory framework used to analyze each issue or resource are presented in Chapter 3 and summarized in Chapter 4 to reduce repetition.

4.2 LAND USE

4.2.1 INTRODUCTION

Compatibility with nearby land uses, aesthetics/visual resources, quality of the built environment, land ownership, and public access are addressed in this section. Land use compatibility with respect to noise is summarized in this section for MCTAB, Dillingham Military Reservation (DMR), Kawailoa Training Area (KLOA), Schofield Barracks East Range (SBER), and Kalaupapa Airport, and addressed in detail in Section 4.5. Land use compatibility with respect to noise was not evaluated for the Kahuku Training Area (KTA) on the island of Oahu, PTA on the island of Hawaii, PMRF on the island of Kauai, Kaula Island, MTSF on the island of Molokai, and the HIARNG Facility on the island of Maui. These areas are not in proximity to noise sensitive receptors to warrant further noise analysis (noise modeling) for the Environmental Impact Statement (EIS), i.e., noise impacts are not anticipated for these areas.

See Table 2-3 in Chapter 2 for brief descriptions of the training areas, including general location, uses, acreages, and land ownership.

4.2.2 AFFECTED ENVIRONMENT

4.2.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

For the analysis of land use impacts associated with proposed activities at MCTAB, the region of influence (ROI) is MCTAB and the portion of the Koolaupoko district of the island of Oahu surrounding the training area (DPP 2000). This is generally Section 3, Kailua, and Section 4, Waimanalo, as identified in Figure 3-1.

Nearby Land Uses. MCTAB is a 1,074-acre (ac) (434.6-hectare [ha]) area bordered by Waimanalo Bay to the east, Keolu Hills and Lanikai to the north, and the town of Waimanalo to the south and west (see Figure 2-8). Nearby land uses include primarily low-density residential and open space/preservation. Other uses include agriculture, parks, and golf courses. The City and County of Honolulu (City) *General Plan* (DPP 2002) designates the eastern portion of the Koolaupoko district, in which MCTAB is located, to remain a residential area with limited future population growth and to maintain small-scale agricultural uses in the inland areas of Waimanalo. Adjacent to MCTAB, to the northeast and southeast, is Bellows Air Force Station (AFS). The approximately 250-ac (101 ha) AFS provides training, recreation, and leisure programs that support U.S. Department of Defense (DoD) military and civilian personnel and their families.[1] In the southwest corner of MCTAB, the HIARNG operates a 48-ac (19.4-ha) training facility on land leased from the Marine Corps.

Existing (baseline year of 2009) aircraft noise is produced by Marine Corps CH-53D helicopters training at MCTAB. Based on computer model analysis (see Section 4.5), existing sound levels do not equal or exceed 65 decibels (dB) Day-night Average Sound Level (DNL) outside of MCTAB.

Aesthetics/Visual Resources. Views into MCTAB from Kalanianaole Highway and Waimanalo Beach Park are obscured by vegetation. Other views into MCTAB exist from hiking trails, from Keolu Hills, and from offshore areas in Waimanalo Bay. Notable views from MCTAB orient seaward towards Mokulua Islands and Manana Island.

Quality of the Built Environment. The built environment at MCTAB consists of the abandoned runways, used as landing zones during training exercises, as well as structures used for Military Operations in Urban Terrain (MOUT) training and the HIARNG training facility. Much of MCTAB is covered in vegetation. The Marine Corps has evaluated the runways and determined that they are not eligible for listing in the National Register of Historic Places (NRHP); State Historic Preservation Officer (SHPO) concurrence is pending. No buildings are in the immediate vicinity of the landing zones proposed for use by the new squadrons.

Land Ownership. In October 1999, the 1,074-ac (434.6-ha) training area was transferred from the Air Force to MCB Hawaii for responsibility and control. Prior to obtaining control, since the early 1950s, the Marine Corps routinely used this training area as a tenant of the Air Force.

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[1] Bellows Air Force Station. http://bellowsafs.com/, accessed on March 1, 2011.

The following is a summary from the Final Environmental Impact Statement and Land Use and Development Plan for Bellows Air Force Station (PACOM 1995):

Bellows AFS was previously the Waimanalo Military Reservation, developed around the time of the Spanish-American War and World War I. By Presidential Executive Order in 1917, 1,496.59 ac (605.65 ha) of territorial public land was ceded to the federal government.[2] Over the years, the installation's boundary was modified as small parcels were returned to the Territory or State of Hawaii and additional area was acquired by the federal government to support the expansion of runways. Most of the land consists of public lands that were ceded and/or "set-aside" for military use through Governor or Presidential Executive Orders. The property has various easements for utilities, roadways, and maintenance right of ways. Along Waimanalo Stream a portion of the land is owned by the federal government, acquired from the Waimanalo Sugar Company in 1943 (PACOM 1995).

Public Access. On most weekends and holidays, the beach fronting MCTAB is open to the public for recreational use while access to the inland area remains restricted under an agreement with the City. If necessary, and following agreed-upon notice procedure, MCB Hawaii may restrict weekend/holiday public beach use to accommodate training.

4.2.2.2 Army Training Areas, Island of Oahu

For analysis of land use impacts, the ROI consists of the Army training areas on the Island of Oahu proposed for use by the VMM and HMLA squadrons and surrounding lands. In total, the training areas shown in Figure 2-9 represent approximately 38,516 ac (15,587 ha) of land. The following information is summarized from the *FEIS Permanent Stationing of the 2/25th Stryker Brigade Combat Team,* published by the Department of the Army in February 2008 (Army 2008b).

Nearby Land Uses. Land to the north and east of KTA is agricultural and includes the town of Waialee and Waialee Beach Park. Forest and agricultural land is to the southeast, and KLOA is south and southwest of KTA. Agricultural land is west of KTA, including Pupukea Paumalu Forest Reserve, Pupukea Paumalu Homesteads, and Camp Paumalu. Land uses to the northwest of KTA include agriculture, park, and rural communities.

Most of KLOA is in the Kawailoa Forest Reserve, and the southern portion of KLOA is in the Ewa Forest Reserve. KLOA is bordered on the north by KTA. To the east are private lands,

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2 U.S. Government Executive Order 2565, Order of Withdrawal, dated 28 March 1917.

Kaipapau Forest Reserve, Hauula Forest Reserve, and Sacred Falls State Park. The Helemano Military Reservation is southwest of KLOA, and private agricultural lands are to the west. Existing (baseline year of 2009) noise calculated for KLOA helicopter training events is focused at LZ Black. Existing aircraft noise is limited in areal extent, as the 65 dB DNL does not extend more than 400 feet (ft) (122 meters [m]) in any direction from the LZ.

Land uses in the vicinity of SBER include agriculture, forest, urban, and military. The town of Wahiawa is located along the northwestern border of SBER. KLOA is along the northeastern border of SBER and includes the Ewa Forest Reserve. The Koolau Mountains are east of SBER. Land south of SBER includes forest, agricultural lands, and Mililani Town. Existing (baseline year of 2009) noise calculated for SBER helicopter training events is focused at LZ Ku Tree. Existing aircraft noise is insufficient to generate a 65 dB DNL contour.

The land surrounding DMR is generally undeveloped and includes state-designated prime agricultural land to the east, beaches and the ocean to the north, and some residences to the northeast. Land south of DMR is mountainous and includes a state hunting area to the southwest. Land uses to the west include an inactive quarry, the YMCA's Camp Erdman, and the military's Camp Kaena. Existing (baseline year of 2009) noise associated with DMR helicopter training events is focused around each of the six LZs. Existing aircraft noise is limited in areal extent as the 65 dB DNL does not extend beyond DMR.

Aesthetics/Visual Resources. The Army training areas on Oahu are within the Central Oahu, Koolauloa, and North Shore regions. These training areas encompass a large area with views towards the Koolau and Waianae mountain ranges as well as the ocean.

Quality of the Built Environment. The built environment at the SBER, KTA, and KLOA landing zones consists mainly of access roads. No buildings are in the vicinity of landing zones proposed for training by the squadrons. At DMR, operational facilities include the airfield, an air traffic advisory facility, several hangars, a tie-down area for recreation aircraft, antennae, as well as improved and unimproved roads. The landing zones proposed for use by the Marine Corps squadrons are in open areas with no ancillary facilities.

Land Ownership. The Army training areas on Oahu include a mixture of lands owned or leased by the U.S. Army. The 664-ac (269-ha) DMR is owned by the U.S. Army; the airfield is leased to and operated by the State of Hawaii. The lands that make up the 5,154-ac (2,086-ha) SBER is a combination of leased and ceded lands except for a 2,300-acre parcel owned by the Army. Several of the landing zones at the 9,398-ac (3,803-ha) KTA and the 23,300-ac (9,429-ha)

KLOA proposed for use by the squadrons are on State or private land leased to the U.S. Army. The Army owns all of KTA except for Area A-1, leased from the State.

Public Access. Access to the Army training areas on Oahu is limited to military training, natural resource management, and hiking. Hiking on the Schofield–Waikane Trail, located on the northern boundary of SBER, requires permission from Range Control and Army Support Command. Hunting is allowed on a limited basis. KTA includes two Army-maintained hunting areas: Kahuku Hunting Area and Pupukea State Public Hunting Area. The Kaunala Trail, located in KTA, is open for hiking and bicycling on weekends and holidays. Hiking along the Pupukea Summit Trail, allowed by Army permit, passes along the border of KTA and extends south along the eastern border of KLOA. The airfield at DMR is a general aviation facility open to the public.

4.2.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

For the analysis of land use impacts associated with proposed activities at PTA, the ROI comprises the 131,805-ac (53,339.6-ha) PTA property and surrounding lands (Figure 2-10). Unless otherwise noted, the following PTA information is summarized from the FEIS for Permanent Stationing of the 2/25th Stryker Brigade Combat Team, published by the Department of the Army in February 2008 (Army 2008b).

Nearby Land Uses. Lands surrounding PTA are generally within the state-designated Conservation District. Land uses include cattle grazing, game management, forest reserves, and undeveloped land. Land to the northwest of PTA is agricultural, primarily for cattle grazing, and also provides limited hunting opportunities. Lands to the north of the main PTA area include the Kaohe Game Management Area, Mauna Kea State Park, Mauna Kea Forest Reserve, and Mauna Kea National Natural Landmark. Land to the east and south is included in the Mauna Loa Forest Reserve. To the east of the Keamuku area of PTA is Waikii, a large-lot subdivision on agricultural land. See Figure 2-10 for these locations.

Aesthetics/Visual Resources. From the Saddle Road, the most remarkable views in the PTA vicinity are of the two volcanoes, Mauna Kea and Mauna Loa. Most of PTA is undeveloped, with a concentration of structures located near Saddle Road and visible from the road. PTA is relatively flat, except for a few hills (puu) and sparse vegetation.

Quality of the Built Environment. Military use of PTA began in 1942 with the construction of what is now Saddle Road. The buildings at the PTA cantonment area consist mainly of Quonset huts built between 1955 and 1958, and others structures built around the time of World War II or the Cold War. These are potentially eligible for listing in the NRHP.[3] Bradshaw Army Air Field (BAAF) has an approximately 4,000-ft (1,219-m) runway, 26 helicopter landing pads, and a terminal facility with a control tower, airfield operations, weather forecasting/reporting, and crash rescue.

Land Ownership. State of Hawaii (State) Governor's Executive Order (EO) 1719 set aside 758.3 ac (306.9 ha) of land in January 1956 for U.S. government use of PTA. Presidential EO 11167 acquired 84,057 ac (34,017 ha) from the State. These lands will revert to State ownership if they are not used for military purposes. Another 22,971.0 ac (9,296.1 ha) were added via 65-year leases from the State, which expire in August 2029. Other lands include 24,013.3 ac (9,717.8 ha), acquired by purchase, and an additional 5.5 ac (2.2 ha) consisting of easements and licenses (USAG-HI 2010b). In total, PTA consists of 131,805.1 ac (53,339.7 ha).

Public Access. Access to PTA is limited, by permission and permit only. The exception is the easement for Saddle Road that allows public thoroughfare. Certain areas are open for hunting and other recreational activities, e.g., motocross racing, mountain bike races, archery, bird dog training, etc.

4.2.2.4 Pacific Missile Range Facility Barking Sands (PMRF), Island of Kauai

For the analysis of land use impacts associated with proposed activities at PMRF, the ROI is the area contained within the installation boundaries and nearby lands and offshore waters.

Nearby Land Uses. PMRF is surrounded primarily by State agricultural and conservation lands (Figure 2-11). No residential land uses are in the off-base ROI. The area located between PMRF's eastern boundary and the Mana cliffs, known as the Mana Plain, was previously owned and cultivated by the Kekaha Sugar Co. and was acquired by the State in the early 2000s. The State Department of Agriculture, Agribusiness Development Corporation (ADC), has jurisdiction over the area. ADC has entered into an agreement with the Kekaha Agriculture Association, the primary lessee of the lands, which is responsible for the irrigation, drainage, and common infrastructure systems. Such infrastructure is important to reduce the risk of flooding throughout the Mana Plain and PMRF. The lessees adjacent to the

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[3] The draft USAG-HI Integrated Cultural Resource Management Plan (2001) lists several 1955-1956 "hutments, "presumed to be Quonset-type buildings. These are described as "potentially eligible for the NRHP. The buildings would have to be evaluated for eligibility.

range include Syngenta and Pioneer Hi-Bred International seed farms and Sunrise Capital LLC shrimp farm.

Polihale State Park, a shoreline park, borders the range's north end. The north end of the PMRF runway is more than 2 miles (mi) (3.2 kilometers [km]) from the state park boundary. The State's Kawaiele Waterbird Sanctuary is to the east of the airfield, and the County's Kekaha landfill is located along PMRF's south boundary. Kaumualii Highway (State Highway 50) and North Nohilii Road run inland of and parallel to the range. To the west of PMRF is the Pacific Ocean, transited by commercial fishing, tour and recreational boats. The U.S. Navy maintains water ranges and warning areas used for military training off-shore of PMRF.

The communities of Kekaha and Waimea are located south of PRMF.[4] The south end of the PMRF runway is more than 4.5 mi (7.2 km) from Kekaha, and the town of Waimea is situated further south.

Aesthetics/Visual Resources. Within the installation, the Center Zone airfield containing the landing zones proposed for use by the VMM and HMLA squadrons is surrounded by open grass fields, landscaping, the airfield control tower, low buildings, towers, and communication structures. The landing zones are not visible from the main highway (State Highway 50), which provides access to Polihale State Park, as vegetation and other structures limit or obstruct views from surrounding public roads. Polihale State Park visitors are not able to view the airfield landing zones due to the distance (approximately 1.5 mi [2.4 km]), topography, and curve of the shoreline.

Quality of the Built Environment. The airfield is located in the Center Zone of PMRF. In addition to the airfield, the Center Zone contains air operations, ordnance (Ready Fuels Storage Area) and maintenance facilities, and administration, supply, base services and range operations facilities to the east of the airfield.

Land Ownership. The 2,400-ac (971-ha) PMRF is owned in fee by the U.S. Government except for areas leased from the State (approximately 200 ac [81 ha]) to maintain flood-control drainage pumps, and to meet federal anti-terrorism/force protection (AT/FP) setbacks. The State agricultural lands east of the range are encumbered by long-term restrictive use easements and exclusive easements, negotiated between the Navy and the State. The

[4] Waimea is the name of a town on the island of Hawaii, another town on the southwest coast of Kauai, and a bay on the north shore of Oahu.

easements are related to Ground Hazard Areas (GHA) for missile launching operations, AT/FP setbacks, and the Agricultural Preservation Initiative (API), a passive encroachment buffer. The API is an encroachment partnership between the Navy, State, and County of Kauai, effective until 2029 to preserve over 5,000 ac (2,023 ha) of State land adjacent to PMRF for agricultural purposes. As a condition of the API non-exclusive easement, construction in the API is limited to structures supporting agriculture only, with height limits and other restrictions to prevent encroachment on PMRF activities.

Public Access. Access onto the military range is limited for security reasons and is outlined in a PMRF Memorandum (CNRH 2010, Appendix G). Majors Bay is open to PMRF employees, as well as active duty, reserve, and retired military personnel and dependents holding PMRF recreation passes. Majors Bay is also open to U.S. citizens who qualify and receive an annual recreation pass. Recreational activities include surfing, fishing, boating, and picnicking. A Special Use Fishing Area is located north of Majors Bay extending to the southern end of the airfield. Access is generally allowed Monday to Friday, 5AM to 10PM, and in the Special Use Area on weekends and holidays, except during heightened force protection conditions or range operational periods. The U.S. Navy also hosts special events at the range for invited community members and participates in programs with local schools.

4.2.2.5 Training Areas on the Islands of Molokai and Maui

For the proposed activities on the islands of Molokai and Maui, the ROI includes the training areas and surrounding lands (Figures 2-12 and 2-13).

Nearby Land Uses. MTSF is located south of Molokai Airport, across Maunaloa Highway (Highway 460). Surrounding lands are agricultural. Kalaupapa Airport on the island of Molokai lies on the northwestern tip of Kalaupapa Peninsula adjacent to the shoreline. It is part of the Kalaupapa National Historic Park, home of the Hansen's disease settlement. The HIARNG facility on the island of Maui is centrally located at Puunene, six miles south of Kahului and two miles north of Kihei. Surrounding land use is agricultural. The Maui Raceway Park is located about half a mile to the east.

Existing (baseline year of 2009) noise associated with Marine Corps helicopters at Kalaupapa Airport is focused around the runway. Existing aircraft noise is limited in areal extent as the 65 dB DNL does not extend beyond the airport.

Aesthetics/Visual Resources. MTSF and the immediately surrounding area provide no significant visual resources. Views to and from Kalaupapa Airport include the surrounding waters and steep cliffs above the peninsula. The HIARNG facility and immediately surrounding area provide no significant visual resources.

Quality of the Built Environment. There are no vertical structures at MTSF. The land is mostly covered with vegetation and remnants of concrete foundations or pads. Kalaupapa Airport is an active airfield operated by the State of Hawaii. The built environment consists of the runway, three buildings (terminal, maintenance/office, storage), access road, and parking. HIARNG facilities, built within the last 10 years, consist of buildings that house an armory and organizational maintenance shop, as well as open storage, parking, and landing zone. Remnants of the former Naval Air Station's runways, taxiways, and other facilities are found on the HIARNG parcel. These remains have been determined to be eligible for listing in the NRHP. See Section 4.9 for more information.

Land Ownership. In 1941, Governor's EO 936 transferred 14.108 ac (5.7 ha) for use and purposes as the Molokai Airport Naval Reservation. It is owned and controlled by the Marine Corps.[5]

The other Molokai property, Kalaupapa Airport, is part of the National Historic Park, but owned by the State Department of Transportation. The airport is approximately 55 ac (22.3 ha).[6]

The 30-ac (12-ha) HIARNG facility on Maui is owned by the State (HIARNG 2001).

Public Access. The inactive MTSF is presently accessible from the public roadway. Kalaupapa Airport provides access to Kalaupapa. Other access to the peninsula is via a trail from the top of the cliff and by boat. There is no roadway access to the peninsula. Access to the HIARNG facility is limited to National Guard and other authorized personnel.

4.2.3 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

Construction and improvement activities proposed at MCTAB, PTA, and MTSF would be consistent with existing or intended land uses at these installations. In the case of MTSF, reactivation and improvements of the facility would be consistent with the intent of the

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[5] http://hawaii.gov/hawaiiaviation/hawaii-airfields-airports/molokai/molokai-airport, access on March 14, 2011. TMK zone 5, section 2, plat 04 stamped 14 Jan 1985.

[6] http://iata-airport-code.com/airport/Kalaupapa-Airport-LUP, accessed on 31 March 2011.

Governor's EO 939 conveying MTSF for military use. Additionally, the proposed use of MTSF would be consistent with use/activities at the adjacent Molokai Airport. Construction and improvement activities (low-lying landing zones) planned under the proposed action at MCTAB, PTA, and MTSF would have no effect on views/visual resources or other land use considerations. Therefore, no significant impacts on land use would occur from construction and improvement activities with the proposed action, and no mitigation is required. Under the No Action Alternative, any impacts associated with the proposed action would not occur.

Operational Impacts

Land Use Compatibility. With the exception of MTSF on Molokai, no changes to land uses would occur with the proposed action. Existing training areas would be used by the new squadrons, but existing land uses would continue. Under the No Action Alternative, no changes would occur. For both the proposed action and No Action, no mitigation is required.

With the proposed action, MTSF would change from a vacant, inactive facility to include infrastructure to support Forward Arming and Refueling Point (FARP) training for the MWSD. Improvements would include clearing and grubbing, and if needed, grading and paving as well as fencing. This proposed use of the land would be consistent with uses/activities at the adjacent Molokai Airport. No mitigation is required. With the No Action Alternative, there would be no change in land use at MTSF.

With regard to aircraft noise and land use compatibility, the following training areas were evaluated for potential impacts from aircraft noise because of their proximity to sensitive receptors, such as residential land uses and schools: MCTAB, KLOA, SBER, and DMR on the island of Oahu, and Kalaupapa Airport on the island of Molokai. A preliminary review of the other training areas indicated that aircraft noise would not be an issue given their distance from noise sensitive receptors. The potential impacts of aircraft noise at MCTAB, KLOA, SBER, DMR, and Kalaupapa Airport would be the same under Alternatives A and B (proposed action), and are compared with aircraft noise under the No Action Alternative. Findings of the aircraft noise analysis relative to land use compatibility are summarized below. Further discussions pertaining to aircraft noise are presented in Section 4.5, Noise.

At MCTAB, the 65 dB DNL contour would remain within the installation boundaries, which is similar to existing conditions (baseline year of 2009). Therefore, no land use incompatibilities would occur with implementation of the proposed action. With the No Action Alternative, the 65 dB DNL would also remain within the installation boundaries; hence, there would be no land use incompatibilities.

At KLOA, the 65 dB DNL contour would not extend more than 1,000 ft (305 m) in any direction from LZ Black, which is 400 ft (122 m) greater than the existing condition (baseline year of 2009). The additional area affected consists of the same land use type currently affected and would be compatible with the projected noise levels. For these reasons, no land use incompatibilities would occur with the proposed action. No land use incompatibilities would be associated with the No Action Alternative, as the 65 dB DNL contour would be comparable in size to the baseline condition.

At SBER, the 65 dB DNL contour would not extend more than 200 ft (61 m) from LZ Ku Tree, which is 200 ft (61 m) greater than baseline condition. Because the additional area affected consists of the same land use type currently affected and would be compatible with the projected noise levels, no land use incompatibilities would occur. The No Action Alternative would be comparable to the baseline condition (insufficient operations to generate a 65 dB DNL contour); therefore, no land use incompatibilities would result.

At DMR, the 65 dB DNL contour would not extend beyond the DMR boundaries, which is similar to the baseline condition. Hence, no land use compatibility impacts would occur with the proposed action. The No Action Alternative also would not generate a 65 dB DNL contour outside of DMR; therefore, no land use incompatibilities would occur.

At Kalaupapa Airport, the 65 dB DNL contour would be centered on the runway less than 4,000 ft (1,219 m) in length and 800 ft (244 m) in width. Because the increase in areal extent of the 65 db DNL contour would remain within the same type of land use, no incompatibilities would occur. The No Action Alternative would not generate a 65 dB DNL contour outside of the airport boundary; hence, no land use incompatibilities would occur.

Aesthetics/Visual Resources. During operations, aircraft in transit or during training may be visible from various viewpoints. Several of the training areas are in remote locations, while others are visible to the public. As these are existing training areas, the visual impact would be similar to existing conditions. With the No Action Alternative, there would be no impacts on visual resources. No mitigation would be required for any of the alternatives.

Quality of the Built Environment. With no vertical construction proposed (except for fencing at MTSF), there would be no impacts relative to quality of the built environment. The No Action Alternative would have no impact on quality of the built environment.

Land Ownership. Land ownership would not change at any of the training areas due to the action alternatives or the No Action Alternative. No mitigation is required.

Public Access. With the proposed action, public access to MTSF would be restricted. Current access policies at the other training areas would not change due to the proposed action. There would be no change in access policies with the No Action Alternative.

4.3 AIRSPACE

4.3.1 INTRODUCTION

The Federal Aviation Administration (FAA) is responsible for the management, control, and use of navigable airspace in the U.S. Airspace is defined by vertical and horizontal boundaries, along with the time of use. The FAA categorizes airspace as controlled and uncontrolled. Controlled airspace is designated as one of five classes: A, B, C, D, and E. (Class B is generally used for the nation's busiest airports.) Uncontrolled airspace is designated as Class G. When operating in controlled airspace, all aircraft operators are subject to certain qualifications, operating rules, and equipment requirements. Air traffic control (ATC) service is provided based on the airspace class. Controlled airspace can further be defined as Special Use Airspace (SUA). These airspaces are restricted from general use due to the nature of the activities that occur in that area. Types of SUA include Restricted Airspace, Alert Area, and Warning Area. Further details about airspace are provided in Appendix C-2.

Air traffic control for the Hawaiian Islands is managed by the Honolulu Control Facility (HCF), which houses the Honolulu Center Radar Approach Control, Hawaii-Pacific System Management Office, Honolulu Airport Traffic Control Tower, and the Terminal Radar Approach Control. The HCF is located at Honolulu International Airport. Hawaii has 11 Air Traffic Control Assigned Airspaces (ATCAA), and an Air Route Traffic Control Center (ARTCC) assigned to each ATCAA.

Hawaii does not have published military training routes. All Marine Corps aircraft are based at MCB Hawaii Kaneohe Bay. Because many of the training areas are either on or close to the coast, transit routes to and from training areas throughout the state would be flown primarily over the ocean. However, there are times when flying over land would be necessary, such as entering or leaving PTA or the KTA/KLOA/SBER area. The overland route would be flown over non-residential areas as much as possible, or flown at higher altitudes.[7] Other situations that could require flying over land are weather conditions, emergencies, instructions from the local ATC, or temporary flight restrictions.

[7] Due to the elevations of PTA and the Koolau Range, aircraft would have to climb to higher altitudes. The elevation of Bradshaw Army Airfield, located in PTA, is approximately 6,200 ft. The Koolau Range elevation averages approximately 2,000 ft.

The ROI for the various training areas are typically defined by the airspace class above the area. Hence, ROIs vary by training area.

Aviation operations data for the training areas were developed for three scenarios: baseline, Alternatives A and B, and the No Action Alternative. The baseline scenario employed in this EIS consists of conditions considered representative of the existing environment and which capture aircraft activity during the 2009 timeframe.

Alternatives A and B (proposed action) would have the same aviation operations, reflecting a future environment in 2018 when the introduction of the MV-22 and AH-1/UH-1 aircraft has been fully implemented. For the training areas, the proposed action also reflects the transition of existing CH-53D helicopters to CH-53E helicopters.

The No Action Alternative reflects a future environment in 2018 consisting of reasonably foreseeable conditions at that time but without introduction of the MV-22 and AH-1/UH-1 aircraft. As with the proposed action, the No Action Alternative includes transition from CH-53D helicopters to CH-53E helicopters.

Based on these operational scenarios, effects of the proposed action are compared to those of the No Action Alternative because the No Action Alternative reflects reasonably foreseeable conditions in 2018 that are independent of the proposed action.

4.3.2 AFFECTED ENVIRONMENT

4.3.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

Airspace for MCTAB and Bellows Air Force Station falls under the HCF, which provides air traffic control for this area. This airspace is Class G[8] (Figure 2-8). The ROI is the boundary of MCTAB and extending off shore. Existing Marine Corps aircraft operations at MCTAB are primarily conducted by the CH-53D in support of Marine Air Ground Task Force (MAGTF) operations (combined air and ground troops training such as amphibious assault or MOUT training). Table 4-2 summarizes MCTAB training operations conducted by the Marine Corps in 2009.

[8] Class G airspace is airspace that is not designated as Class A, B, C, D, or E. The airspace above MCTAB has no class designation from the FAA.

Table 4-2. 2009 Annual Marine Corps Operations at MCTAB

Aircraft	CAL	TOTAL
CH-53D	240	240

Source: MCB Hawaii Kaneohe Bay Marine Aviation Group 24 (MAG-24).

4.3.2.2 Army Training Areas on the Island of Oahu

Kahuku Training Area (KTA), Kawailoa Training Area (KLOA), and Schofield Barracks East Range (SBER). Airspace for KTA, KLOA, and SBER are defined by the range boundaries and Alert Area A-311 (see Figure 2-9). Ingress and egress by Marine Corps aircraft to the training areas typically involve the aircraft turning towards the mountains, avoiding populated areas where possible. Crossing over the mountains requires the aircraft to increase altitude. Routes and entry points may vary depending on weather conditions. Most of the Marine Corps aviation activities include general training, pilot qualifications, low altitude training, external work (lifting/lowering cargo), formation flying, and landings. The U.S. Army and HIARNG conduct similar aviation training. Table 4-3 summarizes annual operations at KTA, KLOA, and SBER in 2009. Note that Army operation counts are lower than normal due to a CAB deployment.

Table 4-3. 2009 Estimated Annual Operations at KTA, KLOA, SBER

Aircraft	CAL	LAT	External	TERF	Simulated Air-to-Ground Gunnery	Total
Marine Corps[1]						
CH-53D	3,200		1,554	1,810		6,564
Army[2]						
UH-60	1,857	1,429	714	762		4,762
OH-58	1,365	1,111		540	127	3,143
CH-47	534	368	178	191		1,271
HIARNG[2]						
UH-60	103	52	20	26		201
OH-58	77	63	8	31		179
CH-47	397	271	135	144		947
TOTAL	7,533	3,294	2,609	3,504	127	17,067

Notes
1 MCB Hawaii Kaneohe Bay MAG-24
2 U.S. Army Hawaii Combat Aviation Brigade, Marine Force Pacific (MARFORPAC) G-3.

Dillingham Military Reservation (DMR). Dillingham Airfield is under Class G and Class E airspace (see Figure 2-9—note that Class G is normally not shown on standard aviation flight charts). Class G airspace extends from the surface up to 1,200 ft (365 m) above ground level (AGL). Class E airspace starts at 1,200 ft (365 m) AGL upwards. DMR does not have an air traffic control tower; air traffic is managed through Unicom.[9] The airfield is under State control through a joint lease agreement through 2034 with the Army. General aviation activities include glider flights, sky diving, and aerobatic flying. Civilian activities occur between sunrise and sunset. Night operations are conducted by military helicopters. Table 4-4 summarizes annual operations at DMR in 2009.

Table 4-4. 2009 Estimated Annual Operations at DMR

Aircraft	CAL	LAT	Simulated Air-to-Ground Gunnery	General Aviation	Total
CH-53D	336				336
Army/HIARNG[2]	1,127	140	95		1,362
General Aviation[3]				50,000	50,000
TOTAL	336	918		50,000	51,698

Notes
1 MCB Hawaii Kaneohe Bay MAG-24. 2011.
2 U.S. Army Hawaii Combat Aviation Brigade; MARFORPAC G-3. 2011.
3 DOT, Airports Division. June 2011. *The State of Hawaii Airport Activity Statistics by Calendar Year.*

4.3.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

For airspace evaluation, PTA is considered to have three separate areas: the main area of PTA, the Keamuku parcel, and BAAF. Airspace above the main area of PTA is Restricted Area R-3103 (see Figure 2-10). This SUA is subject to restriction due to activities that pose hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. BAAF airspace is Class D. The ROI for Keamuku would be defined by the range boundary, with the airspace being Class G. Annual operations at PTA in 2009 are summarized in Table 4-5.

[9] Unicom, or universal communication, is an open air radio frequency commonly used at airports where there is no air traffic control tower.

Table 4-5. 2009 Estimated Annual Operations at PTA

Aircraft	CAL	LAT	External	TERF	Live Fire	General Aviation	Total
Marine Corps[1]							
CH-53D	550		161	238	156		1,105
Army[2]							
UH-60	1,102	408	204	204	2,082		4,000
OH-58	653	735		163	1,143		2,694
CH-47	251	120	65	65	588		1,089
HIARNG[2]							
UH-60	257	194	97	103	245		896
OH-58	31	35		8	54		128
CH-47	144	72	36	36	343		631
General Aviation[3]						16,422	16,422
TOTAL	2,988	1,564	563	817	4,611	16,422	26,965

Notes

1 MCB Hawaii Kaneohe Bay MAG-24

2 U.S. Army Hawaii Combat Aviation Brigade, MARFORPAC G-3.

3 U.S. Army Garrison Hawaii Air Traffic Control data. 2011. General aviation activities are typically non-military overflights within the PTA airspaces of Bradshaw AAF and R-3103.

4.3.2.4 Pacific Missile Range (PMRF), Island of Kauai

PMRF consists of 42,000 square nautical miles (NM) (144,056 square km) of controlled airspace and a Temporary Operating Area covering 2.1 million square NM of ocean area (PMRF 2010). For this EIS, the ROI is the Class D airspace above the Main Base at Barking Sands (see Figure 2-11). Estimated 2009 annual operations at PMRF are in Table 4-6.

Table 4-6. 2009 Estimated Annual Operations at Barking Sands Airfield

Aircraft	Aircraft Operations
All	6,947

Source: Personal communication. Mr. Brian Campilango, PMRF Airfield Manager. June 10, 2011. Air traffic data breakdowns for 2009 unavailable.

Kaula Island. Located 19 NM (35 km) southwest of Niihau, Kaula Island is within the SUA Restricted Area R-3107 (see Figure 2-11 inset). The island serves as a target area for live-fire exercises with inert ordnance. The Kaula Island target area is under the scheduling control of Fleet Area Control and Surveillance Facility (FACSFAC) Detachment Pearl Harbor.[10] Activities at Kaula Island are evaluated in the Hawaii Range Complex Final EIS/Overseas EIS (Navy 2008a). Table 4-7 summarizes the 2009 annual Marine Corps training activities at Kaula Island.

Table 4-7. 2009 Annual Marine Corps Operations at Kaula Island

Aircraft	Air-to-Ground Gunnery
CH-53D	148

Source: MCB Hawaii Kaneohe Bay MAG-24.

4.3.2.5 Training Areas on the Islands of Molokai and Maui

Molokai Training Support Facility (MTSF). Airspace above MTSF, which falls under Molokai Airport, is Class D during daytime and Class G during other times. Molokai Airport airspace extends out in a 4.3-mi (7-km) radius from the airport (see Figure 2-12). MTSF is an inactive facility with no current Marine Corps training activities. Both MTSF and the nearby Molokai Airport would serve as a refueling stop for transit between PTA and Kalaupapa Airport and MCB Hawaii Kaneohe Bay. Table 4-8 summarizes 2009 annual operations at Molokai Airport in 2009.

Table 4-8. 2009 Annual Operations at Molokai Airport

Aircraft	Aircraft Operations[1]
Air Taxi, Air Carrier, General Aviation, Military, [2]	24,295

Notes

1 *Aircraft Operations* are the totals of landing and takeoffs combined.

2 DOT, Airports Division. June 2011. *The State of Hawaii Airport Activity Statistics by Calendar Year.*

Kalaupapa Airport. Airspace at Kalaupapa Airport is Class G up to 700 ft (213 m) from the ground. From 700 ft (213 m) and above, the airspace is Class E, and extends out in a 6.3-mi

[10] FACSFAC, based at Joint Base Pearl Harbor-Hickam, provides off-shore air traffic control for the Navy's Pacific Fleet.

(10.1-km) radius from the airport (FR October 2010). (See Figure 2-12.) The Marine Corps CH-53s currently conduct night vision training at Kalaupapa Airport. Table 4-9 summarizes annual operations in 2009 at Kalaupapa Airport.

Table 4-9. 2009 Annual Operations at Kalaupapa Airport

Aircraft	CAL	Aircraft Operations[1]	Total
CH-53D[2]	261		261
Air Taxi, Air Carrier, Military, General Aviation[3]		3,094	3,094
TOTAL	261	3,094	3.355

Notes
1 *Aircraft Operations* are the totals of landing and takeoffs combined.
2 MCB Hawaii Kaneohe Bay MAG-24. 2011.
3 DOT 2011.

HIARNG Facility. Airspace above the HIARNG facility is classified as Class C and is under Kahului Airport tower and approach control. (See Figure 2-13.) There are no existing Marine Corps squadrons training at this facility. Table 4-10 shows 2009 annual operations at Kahului Airport.

Table 4-10. 2009 Annual Operations at Kahului Airport

Aircraft	Aircraft Operations
Air Carrier	40,936
Air Taxi	60,520
General Aviation	9,655
Military	3,328
Local	6,644
TOTAL	121,083

Source: Personal communication. Mr. Henry Bruckner, General Aviation Officer, State Department of Transportation Airports Division. June 3, 2011.

4.3.3 ENVIRONMENTAL CONSEQUENCES

Factors used in evaluating potential impacts on airspace are explained in Section 4.3.1. Such factors include changes in approach/departure patterns, changes in tempo (intensity of operations), and changes in the number of aircraft and aircraft operations using the training area or airport.

Construction Impacts

Proposed improvements to and use of existing landing zones would not affect use of the existing airspace under the proposed action; therefore, no mitigation is required. Under the No Action Alternative, no aviation facility improvements or additional training would occur. There would be no impacts on airspace, and no mitigation is required.

Operational Impacts

The following requirements generally apply to all aircraft in Hawaii:

- Code of Federal Regulations (CFR) Part 91 General Operating and Flight Rules. Other CFRs deal with pilot qualifications, safety, air traffic control, special use airspace, and other air traffic rules.
- FAA regulations and Orders, *Aeronautical Information Manual, Hawaii Air Tour Common Procedures Manual, Airport Directory and Flight Safety Manual,* Notice to Airmen, Air Traffic Control Tower instructions, Instrument Flight Rules (IFR), and Visual Flight Rules (VFR).
- State guidelines are contained in the *Hawaii Airports and Flying Safety Guide* (DOT 2010).
- National Marine Sanctuary Program Regulations (15 CFR 922).
- Papahanaumokuakea Marine National Monument, administered by National Oceanographic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), and the State Department of Land and Natural Resources (DLNR).
- CFR Title 50 Wildlife and Fisheries, Chapter 4, Part 404
- Hawaii Administrative Rules (HAR) Title 13, Subtitle 4, Chapter 60.5.

Other regulations that apply to the Marine Corps include:

- OPNAVINST 3710.7U Naval Air Training and Operating Procedures Standardization (NATOPS) General Flight and Operating Instructions (applies to Navy and Marine Corps aircraft).
- Specific aircraft NATOPS manual.

- Marine Corps Air Station (MCAS) Kaneohe Bay Air Operations Manual (MCASO P3710.1F).
- MCAS Kaneohe Bay Course Rules (applies to aircraft operating at MCAS Kaneohe Bay).
- U.S. Army Garrison Hawaii PTA External Standard Operating Procedures (USAG-HI 2008b).

With the proposed action, the above requirements would continue to be followed; the use of existing airspace for all training areas would not change; training operations would continue to operate within the established parameters of the designated airspace and entities controlling the airspace; no change in the use of airspace, the airspace designation, or the size of the airspace coverage would be necessary to accommodate the increase in training as described in Table 4-11 throughTable 4-25; and the increase in the tempo of operations could be managed by existing airspace managers. For these reasons, no mitigation is required. Under the No Action Alternative, no aviation facilities improvements or additional training would occur; therefore, no mitigation is required.

For Alternatives A and B, airspace activities at the training areas would include operations associated with the proposed action along with other actions not associated with the proposed action, such as the CH-53E squadron and other aviation users of the area. No impacts associated with the proposed action would occur; no mitigation is required.

4.3.3.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

Proposed training activities at MCTAB would primarily support GCE training, including amphibious assaults and MOUT. Table 4-11 and Table 4-12 identify proposed 2018 aviation operations at MCTAB. Projected Marine Corps aviation operations at MCTAB under Alternatives A or B would be 255 more operations compared to No Action. Under the No Action Alternative, there would be 27 operations (11%) less than baseline.

Table 4-11. Planned 2018 Annual Operations at MCTAB Under Alternatives A/B

Aircraft	CAL	Insert/Extract (External Operations)	Simulated Air-to-Ground Gunnery	TOTAL
Proposed Action				
MV-22[1]	114			114
AH-1[1]			122	122
UH-1[1]		125[3]		125

Table 4-11. Planned 2018 Annual Operations at MCTAB Under Alternatives A/B

Aircraft	CAL	Insert/Extract (External Operations)	Simulated Air-to-Ground Gunnery	TOTAL
Other Actions				
CH-53E[2]	107			107
TOTAL	221	125	122	468

1 U.S. Marine Corps Headquarters
2 One CH-53E squadron.
3 UH-1 insert/extract activities would include simulated air-to-ground gunnery.

Table 4-12. Planned 2018 Annual Marine Corps Operations at MCTAB Under No Action Alternative

Aircraft	CAL
CH-53E[1]	213

1 Two CH-53E squadrons. Source: MCB Hawaii Kaneohe Bay MAG-24.

4.3.3.2 Army Training Areas on the Island of Oahu

Kahuku Training Area (KTA), Kawailoa Training Area (KLOA), Schofield Barrack East Range (SBER). The established Special Use Area A-311 (which includes KTA, KLOA, and SBER) would not be modified under the action alternatives. The types of training activities at the Army's KTA, KLOA, and SBER areas would not change from 2009 activities under the proposed action. Table 4-13 and Table 4-14 give projections of proposed 2018 aviation operations at these training areas. Annual operations under Alternative A or B would be 413 (2%) less operations compared to the No Action Alternative. Under the No Action Alternative, there would be 7,673 (45%) operations more than baseline.

Table 4-13. Planned 2018 Annual Operations for KTA, KLOA, SBER Under Alternatives A/B

Aircraft	CAL	LAT	External	TERF	Other	TOTAL
Proposed Action						
MV-22[1]	798	30	1,008	27		1,863
AH-1[1]	158			53		211
UH-1[1]	344			87		431

Table 4-13. Planned 2018 Annual Operations for KTA, KLOA, SBER Under Alternatives A/B

Aircraft	CAL	LAT	External	TERF	Other	TOTAL
Other Actions						
CH-53E[2]	1,422		691	804		2,917
Army/HIARNG[3]					18,905	18,905
TOTAL	2,722	30	1,699	971	18,905	24,327

Notes
1 U.S. Marine Corps Headquarters
2 One CH-53E quadroon. Source: MCB Hawaii Kaneohe Bay MAG-24
3 MARFORPAC G-3; U.S. Army Hawaii, Combat Aviation Brigade

Table 4-14. Planned 2018 Annual Operations at KTA, KLOA, and SBER Under No Action Alternative

Aircraft	CAL	External	TERF	Other	Total
CH-53E[1]	2,845	1,381	1,609		5,835
Army/HIARNG[2]				18,905	18,905
TOTAL	2,845	1,381	1,609	18,905	24,740

Source: MCB Hawaii Kaneohe Bay MAG-24
1 One CH-53E squadron.
2 MARFORPAC G-3; U.S. Army Hawaii Combat Aviation Brigade.

Dillingham Military Reservation (DMR). Proposed training activities at DMR would continue to be night vision device (NVD) training. Table 4-15 and Table 4-16 identify projections of proposed 2018 annual aviation operations at DMR. Under Alternatives A or B, there would be 1,138 (2%) more annual operations compared to the No Action Alternative. From 1999 to 2010, takeoff/landing operations at DMR have averaged 62,097 operations, with a peak of 84,791 aircraft operations in 2000.[11]

[11] State of Hawaii, Department of Transportation, Airports Division. No date. *The State of Hawaii Airport Activity Statistics by Calendar Year.*

Table 4-15. Planned 2018 Annual Operations at DMR Under Alternatives A/B

Aircraft	CAL	Other	Total
Proposed Action			
MV-22[1]	684		684
AH-1/UH-1[1]	692		692
Other Actions			
CH-53E[2]	151		151
Army/HIARNG		2,338	2,338
General Aviation[3]		63,282	63,282
TOTAL	1,527	65,620	67,147

1 U.S. Marine Corps Headquarters
2 MCB Hawaii Kaneohe Bay MAG-24. One CH-53E squadron.
3 General aviation increase based on FAA forecasts for 2030. Source: FAA. 2010. *Aerospace Forecast Fiscal Years 2010–2030.*

Table 4-16. Planned 2018 Annual Marine Corps Operations at DMR Under No Action Alternative

Aircraft	CAL	Other	Total
CH-53E[1]	89		89
Army/HIARNG		2,338	2,338
General Aviation[2]		63,282	63,282
TOTAL	89	65,620	65,709

1 Two CH-53E squadrons. Source: MCB Hawaii Kaneohe Bay MAG-24
2 Increase based on FAA forecasts for 2030. Source: FAA. 2010. *Aerospace Forecast Fiscal Years 2010–2030.*

4.3.3.3 Pohakuloa Training Area (PTA), Island of Hawaii

The established Special Use Area R-3103 (which includes most of PTA) would not be modified under the action alternatives. Proposed training activities at PTA, while increasing, would not change the installation’s overall airspace management. Table 4-17 and Table 4-18 provide estimates of proposed 2018 aviation operations at PTA. Under Alternatives A or B, there would be 9,921 more annual operations (27%) when compared to the No Action Alternative. Under the No Action Alternative, there would be 10,312 (38%) operations more than baseline. (Note that the operation counts for 2009 are lower than normal due to deployments of the Army's and Marine Corps' aviation units.)

Table 4-17. Planned 2018 Annual Marine Corps Operations at PTA For Alternatives A/B

Aircraft	CAL	LAT	External	TERF	Live Fire	Other	Total
Proposed Action							
MV-22[1]	7,866	225	168	200	56		8,515
AH-1[1]					1,270[5]		1,270
UH-1[1]					376[5]		376
Other Actions							
CH-53E[2]	247		72	106	69		494
Army/HIARNG[3]						15,116	15,116
Transient[4]						21,427	21,427
TOTAL	8,113	225	240	306	1,771	36,543	47,198

1 U.S. Marine Corps Headquarters
2 One CH-53E squadron. Source: MCB Hawaii Kaneohe Bay MAG-24
3 Source: MARFORPAC G-3 and Army Combat Aviation Brigade (CAB).
4 Transient aircraft increase based on FAA forecasts for 2030. Source: FAA. 2010. *Aerospace Forecast Fiscal Years 2010–2030.*
5 Live-fire operations also include CAL and TERF activities.

Two major factors account for the difference between the action alternatives and the No Action Alternative. One, PTA provides a large enough area for MV-22 training. Second, the H-1s have a higher requirement for live-fire training, and PTA is the only place in Hawaii that can accommodate all of the live-fire requirements. (The PMRF water ranges and Kaula Island provide limited live-fire training.) No impacts to the PTA airspace are expected. Based on 2009 BAAF tower count data, a projected monthly average at BAAF is approximately 3,583 operations per month.[12] This results in 42,996 operations a year. The resulting overall increase under Alternatives A and B is 10 percent when compared to the averaged annual operations.

[12] Only the months of January through July for 2009 were used to calculate the monthly average. These months were chosen as the Army CAB deployed starting July.

Table 4-18. Planned 2018 Annual Operations at PTA Under No Action Alternative

Aircraft	CAL	External	TERF	Live Fire	Other	Total
CH-53E[1]	240	143	212	139		734
Army/HIARNG[2]					15,116	15,116
Transient[3]					21,427	21,427
TOTAL	240	143	212	139	36,543	37,277

1 Two CH-53E squadrons. Source: MCB Hawaii Kaneohe Bay MAG-24
2 Source: MARFORPAC G-3 and U.S. Army Hawaii Combat Aviation Brigade
3 Transient aircraft increase based on FAA forecasts for 2030. Source: FAA. 2010. *Aerospace Forecast Fiscal Years 2010–2030.*

4.3.3.4 Pacific Missile Range Facility (PMRF), Island of Kauai

The established airspaces around PMRF—Class D, R-3107 over Kaula Island, and warning areas—would not be modified under the action alternatives. Proposed training activities at PMRF, while increasing by 74 percent compared to 2009, would not change the overall airspace management at PMRF. Tower data from 2000 through 2010 show Barking Sands Airfield averaging 12,120 annual operations, with a peak of 16,500 operations in 2001. Future Navy and Marine Corps activities at PMRF are assessed in the Hawaii Range Complex Final EIS/OEIS and its update, currently in progress (Navy 2008a). Table 4-19 and Table 4-20 identify proposed 2018 annual aviation operations at PMRF. Table 4-21 and Table 4-22 give estimates of proposed Marine Corps 2018 aviation operations at Kaula Island.

For PMRF, under Alternative A or B, there would be 1,934 (19%) operations more than the No Action Alternative. Under the No Action Alternative, there would be 3,203 (46%) operations more than baseline. For Kaula Island, the additional 262 Marine Corps aviation operations under Alternatives A or B would be 130 operations more than the No Action Alternative.

Table 4-19. Planned 2018 Annual Operations at Barking Sands Airfield Under Alternatives A/B

Aircraft	CAL	LAT	Simulated/Air-to-Ground Gunnery[1]	Other	Total
Proposed Action					
MV-22[2]	1,710	46			1,756
AH-1[2]			100		100
UH-1[2]			78		78
Other Actions					
CH-53E[3]					0
All Others[4]				10,150	10,150
TOTAL	1,710	46	178	10,150	12,084

Notes

1. Air-to-ground gunnery conducted within the ocean training range.
2. Source: U.S. Marine Corps Headquarters
3. One CH-53E squadron. Source: MCB Hawaii Kaneohe Bay, MAG-24. PMRF would serve as a stopping/refueling point for training conducted at Kaula Island.
4. Aircraft includes Army, Navy, Air Force, Coast Guard, civilian, transient, and PMRF-based aircraft. Personal Communication with Mr. Brian Campilango, Airfield Manager. June 15, 2011. Aircraft operations data provided for 2010. This was assumed to represent conditions in 2018.

Table 4-20. Planned 2018 Annual Operations at Barking Sands Airfield Under No Action Alternative

Aircraft	Other[4]	Total
CH-53E[1]		0
All Others[2]	10,150	10,150
TOTAL	10,150	10,150

Notes

1. Two CH-53E squadron. Source: MCB Hawaii Kaneohe Bay, MAG-24. PMRF would serve as a stopping/refueling point for training conducted at Kaula Island.
2. Aircraft includes Army, Navy, Air Force, Coast Guard, civilian, transient, and PMRF-based aircraft. Personal Communication with Mr. Brian Campilango, Airfield Manager. June 15, 2011. Aircraft operations data provided for 2010. This was assumed to represent conditions in 2018.

Table 4-21. Planned 2018 Annual Marine Corps Operations at Kaula Island Under Alternatives A/B

Aircraft	Air-to-Ground Gunnery	Total
Proposed Action		
MV-22[1]	84	84
AH-1[1]	100	100
UH-1[1]	78	78
Other Actions		
CH-53E[2]	66	66
TOTAL	328	328

Notes
1 Source: U.S. Marine Corps Headquarters
2 One CH-53E squadron. Source: MCB Hawaii Kaneohe Bay MAG-24

Table 4-22. Planned 2018 Annual Marine Corps Operations at Kaula Island Under No ActionAlternative

Aircraft	Air-to-Ground Gunnery
CH-53E	132

Two CH-53E squadrons. Source: MCB Hawaii Kaneohe Bay MAG-24.

4.3.3.5 Training Areas on the Islands of Molokai and Maui

Molokai Training Support Facility (MTSF). Molokai Airport would be used as a refueling stop for Marine Corps aircraft transiting from Kalaupapa Airport or PTA to Oahu. No tactical aviation training activities would occur at the airport. MTSF and the airport would be occasionally used by the Marine Corps. Table 4-23 provides estimates of civilian aviation 2018 operations at the airport. Marine Corps aviation activities at MTSF would add a minimal amount to normal airport operations.

For purposes of the EIS analysis, it is assumed that the Marine Corps would not conduct aviation-related training at MTSF under the No Action Alternative.

Table 4-23. Estimated 2018 Annual Operations at Molokai Airport (MTSF Airspace)

Aircraft	Civilian
Civilian/ General Aviation	27,779

Source: Increase based on FAA forecasts for 2030. Source: FAA. 2010. *Aerospace Forecast Fiscal Years 2010–2030.*

Kalaupapa Airport. No special use airspace would be established over Kalaupapa Airport for the proposed training activities, which would include NVD training. Table 4-24 and Table 4-25 identify projections of proposed 2018 annual aviation operations at the airport. Annual operations under Alternative A or B would be 1,343 (36%) operations more than the No Action Alternative. Comparing the No Action Alternative with baseline, there would be an increase of 340 (10%) operations. While the proposed aviation operations in 2018 would result in a large increase, the operations would be conducted after the airport closes for the day.

Table 4-24. Planned 2018 Annual Operations at Kalaupapa Airport Under Alternatives A/B

Aircraft	CAL	Civilian	Total
Proposed Action			
AH-1/UH-1[1]	1,388		1,388
Other Actions			
CH-53E[2]	112		112
Civilian operations[3]		3,538	3,538
TOTAL	1,500	3,538	5,038

1 Source: U.S. Marine Corps Headquarters
2 One CH-53E squadron. Source: MCB Hawaii Kaneohe Bay MAG-24
3 Increase based on FAA forecasts for 2030. Source: FAA. 2010. *Aerospace Forecast Fiscal Years 2010–2030.*

Table 4-25. Planned 2018 Annual Operations at Kalaupapa Airport Under No Action Alternative

Aircraft	CAL	General Aviation	Total
CH-53E[1]	157		157
Civilian[2]		3,538	3,538
TOTAL	157	3,538	3,695

1 Two CH-53 squadrons. Source: MCB Hawaii Kaneohe Bay MAG-24
2 Increase based on FAA forecasts for 2030. Source: FAA. 2010. *Aerospace Forecast Fiscal Years 2010–2030.*

HIARNG Facility. No special use airspace would be established over the HIARNG Facility. No aviation training activities are proposed at the facility, other than landing at the existing helipad. The HIARNG Facility is also located within a major flight corridor for Kahului Airport. For purposes of the EIS analysis, it is assumed that the Marine Corps would not conduct training related to aviation activities at the HIARNG facility.

4.4 AIR QUALITY

4.4.1 INTRODUCTION

Section 3.4.2 describes the regulatory conditions, ROI, and air emissions (statewide emissions only) for air quality that are applicable to the other training areas. As discussed in Section 3.4.2, the state of Hawaii is in attainment of the National Ambient Air Quality Standards (NAAQS) and also meets the State AAQS. Exceptions include exceedances of the NAAQS for sulfur dioxide (SO_2) because of natural events—Kilauea volcano on Hawaii Island—and the NAAQS for PM2.5 because of exceptional events—New Year's fireworks. As the entire state is in attainment of the NAAQS, emissions from the proposed action are not subject to the General Conformity Regulations, 40 CFR Parts 51 and 93, pursuant to section 176(c) of the Clean Air Act (FR April 2010).

4.4.2 AFFECTED ENVIRONMENT

Local air emissions are characterized for each of the training areas in the following subsections.

4.4.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

The types of existing air emissions at MCTAB are similar to those at MCB Hawaii Kaneohe Bay and consist primarily of emissions resulting from the combustion of fuel by aircraft engines, vehicular engines, boilers, and generators. MCTAB provides for company-sized amphibious training and associated aircraft support training, but the quantity of the emissions is substantially lower than those for MCB Hawaii Kaneohe Bay due to the more limited functions conducted at MCTAB (e.g., training facility that does not support basing or housing), smaller size (e.g., limited number of LZs), and frequency of use (e.g., intermittent exercises). In 2010, MCTAB had a resident population of only 19 persons, and only 240 helicopter operations (Confined Area Landings [CAL]) per day occurred here.

In the neighboring community of Waimanalo, the residential population was 9,932 in 2010.[13] Emissions in this residential and agricultural community are primarily from vehicles and agricultural related activities.

4.4.2.2 Army Training Areas on the Island of Oahu

The types of existing air emissions at Army training areas on the island of Oahu consist primarily of those resulting from the combustion of fuel by aircraft engines, vehicular engines, and generators. With the exception of the western portion of the 5,154-ac (2086-ha) SBER (which provides maintenance, parachute drop zones, and administrative offices) and the 664-ac (269-ha) DMR (which provides an airfield), Army training areas on the island of Oahu are generally landing zones located in the relatively remote central and northern forested mountain ranges of the island.

4.4.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

The types of existing air emissions at PTA are similar to MCB Hawaii Kaneohe Bay and consist primarily of emissions resulting from the combustion of fuel by aircraft engines, vehicular engines, boilers, and generators. Additional emission sources from the largest training facility in Hawaii, well over 100,000 ac (40,469 ha), include those associated with fugitive dust from unimproved areas (best to simulate warfighting conditions) and ordnance associated with live-fire training. Naturally occurring volcanic smog (vog) can also affect the PTA area. Under trade wind conditions, vog travels southwest and then up along the Kona Coast where on-shore breezes carry the emissions up into the topographic saddle,[14] between Mauna Kea and Mauna Loa, where PTA is located.

Waikii Ranch, a subdivision of large residential lots, is immediately adjacent to the Keamuku area of PTA and northwest of the main area of PTA. The nearest town, Waimea, is approximately five miles to the north. Both Waikii Ranch and Waimea are part of the Upland

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13 U.S. Census, 2010.

14 http://volcanoes.usgs.gov/hazards/gas/volgaspollution.php, accessed 25 March 2011.

South Kohala census tract (Number 217.02) that reported a population of 9,540 in 2010. [15] Emissions in the vicinity of PTA are primarily from vehicles, agricultural related activities, and rock quarry operations. Emissions around PTA are few and far between as lands to the north, east, and south of PTA include the Kaohe Game Management Area, Mauna Kea State Park, Mauna Kea Forest Reserve, Mauna Kea National Natural Landmark, and Mauna Loa Forest Reserve.

PTA is situated in the saddle area between Mauna Kea to the northeast and Mauna Loa to the south. Air flow within the saddle is increased as it moves upslope and is constrained horizontally by these topographic features which can either create fugitive dust or increase existing releases of fugitive dust. Three years of data from the Army's on-site weather stations located at the eastern and western portions of PTA have been used to characterize wind speeds (Army HQ 2008b). Average hourly wind speeds at the eastern and western stations were 13 miles per hour (mph) and 8.4 mph, respectively. Wind speeds at which wind erosion (fugitive dust) is generally a factor were also evaluated. At the eastern station, wind speeds exceeded the 15 mph threshold commonly associated with wind erosion approximately 35 percent of the time. At the western station, a 12 mph threshold was used (for lower-density silty soils, relative to the eastern side of PTA); wind speeds exceeded this threshold approximately 15 percent of the time.

Air monitoring conducted between January 29, 2006 and June 30, 2007 at seven stations around PTA indicated that all 24-hour PM_{10} concentrations met National and State AAQS (Army HQ 2008b). Air samples were collected once every six days over a 24-hour period and included sampling during training of the 2/25th SBCT, in which both maneuver and live fire training (small arms training and mortars) occurred.

4.4.2.4 Pacific Missile Range Facility (PMRF), Island of Kauai

The types of existing air emissions at PMRF are similar to those at MCB Hawaii Kaneohe Bay and consist primarily of emissions resulting from the combustion of fuel by aircraft engines, vehicular engines, boilers, and generators. Additional emission sources include those associated with missile launches. Analysis of typical launch vehicles at PMRF determined that exhaust emissions would not produce short-term exceedance of either the NAAQS or health-based guidance levels in areas to which the general public would have access (Navy 2008a).

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[15] U.S. Census, 2010.

4.4.2.5 Training Areas on the Islands of Molokai and Maui

Molokai. The types of existing air emissions at both the existing and proposed training areas on Molokai are similar to one another, given that the training areas are either at or adjacent to airports. The Kalaupapa Airport serves the residents of that community and provides access to and from the community (now designated as a National Park) for registered visitors. Generally, only one flight per day in a small passenger plane occurs. At the inactive MTSF, where no emissions occur, air emissions occur at the adjacent Molokai Airport, the main airport serving the island population of 7,255[16] and its visitors.

In the neighboring communities of west Molokai, the residential population in 2010 was 2.753.[17] Emissions from these communities are primarily from vehicles and agricultural related activities.

Maui. The types of existing air emissions at the HIARNG facility on Maui are similar to those at MCB Hawaii Kaneohe Bay and consist primarily of emissions resulting from the combustion of fuels by aircraft engines, vehicular engines, boilers, and generators. However, the quantity of these emissions is substantially less at this smaller 30-ac (12-ha) armory site. The HIARNG facility is in Puunene, where sugar cane is burned, harvested, and processed. Bagasse (cane fiber), a byproduct of sugar production, is used as a primary fuel source for a 16-megawatt (MW) electrical generating facility in the town.[18]

4.4.3 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

With the exception of the planned improvements at MCTAB, PTA, and MTSF, no development would occur at the existing training areas. Most of the sites would remain unimproved as the conditions simulate rural conditions encountered during warfare. Any demolition, earth-moving activities, and use of construction-related equipment (such as generators) and construction related vehicles would result in air emissions. Based on the areal extent of the planned improvements in Table 4-1, construction related emissions from fossil-fuel combustion and fugitive dust have been estimated and are summarized in Table 4-27. Supporting documentation is presented in Appendix E.

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16 U.S. Census, 2010. The number covers the upland population, excluding the 90 residents of Kalaupapa.

17 U.S. Census, 2010.

18 http://mauinow.com/2011/02/08/maui-electric-seeks-to-add-50-megawatts-of-firm-renewable-power/, accessed 16 March 2011.

Table 4-26. Estimated Annual Air Emissions From Construction at Other Training Areas

Alternative	CO (tons/yr)	NOx (tons/yr)	SOx (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)
A/B	0.19	0.33	0.00	0.12	0.04

Construction related emissions would not significantly impact air quality because they are short-term and existing controls and requirements apply. Such controls and requirements include:

- Implementation of traffic control plans for construction related deliveries;
- Control of fugitive dust associated with structural demolition, earthmoving activities, and truck transport (HAR 11-60.1-33 prohibits the generation of visible fugitive dust without taking reasonable precautions such as the use of water for controlling fugitive dust during demolition or road grading); and
- Compliance with operating permit conditions, including contractor compliance with equipment under their control, e.g., portable generators.

No significant impacts on air quality would occur as a result of construction associated with the proposed action and no mitigation is required. Because no construction would take place under the No Action Alternative, no impacts on air quality would occur.

Operational Impacts

The proposed action would introduce new types of aircraft, personnel, and supporting facilities to Hawaii. New aircraft would serve to reduce the number of aging aircraft using less efficient combustion technology and having higher emission characteristics. Table 3-6 summarizes the Marine Corps plans to change aircraft from 2010 to 2018. Table 3-7 summarizes the estimated emissions from MV-22 and H-1 operations at MCB Hawaii Kaneohe Bay.

Table 4-27 reflects the additional emissions from operations at other training areas listed in Table 2-3 and in transit within the state. Details supporting these emission estimates are presented in Appendix E. As shown in Table 4-27, pollutant emissions from other training areas would be below the PSD level used to evaluate whether potential impacts on air quality should be further evaluated.

Table 4-27. Estimated Annual Air Emissions from MV-22 and H-1 at Other Training Areas

Squadrons/ Aircraft	Non-MCAS Emissions (tons/yr)					
	CO	NOX	SO_2	PM10	PM2.5	ROG
VMM/MV-22 (24 aircraft)	38.68	199.00	7.26	26.78	26.78	0.66
HMLA/AH-1 (15 aircraft)	18.12	9.48	0.69	7.18	7.18	0.96
HMLA/UH-1 (12 aircraft)	22.85	11.99	0.87	9.08	9.08	1.21
Totals	**79.65**	**220.48**	**8.81**	**43.04**	**43.04**	**2.83**
Emissions totals greater than PSD reference of 250 tons/yr.	No	No	No	No	No	Not applicable

NA - Not available

Presumes 2 VMM squadrons (12 aircraft/squadron) and 1 HMLA squadron (15 AH-1 and 12 UH-1)

Emissions of fugitive dust from rotary wing downwash would occur at unpaved landing zones. Based on meteorological and soil conditions, fugitive dust is primarily a concern at PTA. Fugitive dust emissions at these locations are expected to remain within the training areas, as the relatively large particle size of fugitive dust (compared to smaller particles resulting from combustion) tend to fall out of the atmosphere quickly. However, should visible fugitive dust become an issue, the Marine Corps would modify use of landing areas and/or identify improvements at these landing areas to minimize fugitive dust. The smaller particulates that are of concern for effects on human health, e.g., PM_{10}, have been shown to remain within National and State AAQS during training of the 2/25th SBCT (Army HQ 2008b). Such training included both maneuver and live fire training (small arms training and mortars).

No significant impacts on air quality would occur from aircraft emissions at other training areas with the proposed action. Emissions are unlikely to be concentrated and significantly affect National or State AAQS, considering that the emissions would be less than PSD thresholds, the dispersive nature of the aircraft emissions, and the dispersive nature of the atmospheric environment in the state of Hawaii. Furthermore, emissions from other training areas would be released over large areas, not a point or small area, thereby reducing any impact on air quality. No mitigation is required.

Additional air emissions from the proposed action are limited to those from aircraft. No additional ground/tactical support equipment or additional vehicle trips would be needed at these other training areas.

Under the No Action Alternative, no changes would occur so no impacts on air quality would result.

4.5 NOISE

4.5.1 INTRODUCTION

Noise from the proposed action at other training areas would be predominantly from aircraft operations. Temporary noise would be generated from the relatively small construction projects; however, such activities would occur in remote locations that would not impact off-site civilian populations and, therefore, are not further evaluated.

Section 3.5.1 defines the descriptors used in the noise modeling that are also applicable to the other training areas. Additional information in this section specific to other training areas includes the ROI, methodology, and assumptions with respect to assessing aircraft noise. For each training area evaluated in Chapter 4, the ROI from aircraft noise is the area encompassed by the 65 DNL contour. The methodology and assumptions follow. See Appendix D for additional information.

Based on a preliminary aircraft noise study (Ebisu 2010), training operations at KTA on the island of Oahu, PTA on the island of Hawaii, PMRF on the island of Kauai (including Kaula Island), MTSF on the island of Molokai, and the HIARNG facility on the island of Maui would not be in proximity to noise sensitive receptors, such as residential land uses and schools, to warrant further noise analysis for the EIS, i.e., noise impacts are not anticipated for these areas/sites. For this EIS, a detailed noise analysis was performed for the following training areas:

- LZs at MCTAB, KLOA, SBER, and DMR on the island of Oahu; and
- Kalaupapa Airport on the island of Molokai.

For KLOA and SBER, only one LZ in each of these training areas has the potential for noise impacts – LZs Black and Ku Tree, respectively.

For LZs at MCTAB, KLOA, SBER, DMR, and Kalaupapa, the noise analysis was similar to the analysis conducted for MCB Hawaii Kaneohe Bay. The NOISEMAP suite of programs was used to estimate DNL contours from specific flight track/profile-driven operations at and in the vicinity of each LZ. The Marine Corps and the Army provided estimates of annual training operations. Of the many types of training operations, only CALs and External (EXT) operations were considered applicable to the LZs for the purposes of the noise analysis. The Marine Corps further estimated the distribution of operations among LZs within each training area. At DMR, operations were distributed equally among the LZs.

Acoustic data was not readily available for every airframe; hence, the following surrogates were used for modeling purposes. Marine Corps CH-53D operations were modeled using CH-53E data. Marine Corps AH-1 and UH-1 operations were modeled using AH-1W data. MV-22 operations were modeled using MV-22B data. Army and HIARNG CH-47, OH-58 and UH-60 helicopters were modeled with one airframe—the SH-60B—because of the dominance of the UH-60 operations compared to the other Army/HIARNG airframes.

Although Kalaupapa Airport is currently used for both general aviation (GA) and for Marine Corps aviation training, the contribution of the GA operations to the overall aircraft noise environment is anticipated to be negligible. For this reason, only the Marine Corps training events were modeled for the purposes of this EIS.

For input into the NOISEMAP suite of programs, annual operations were converted into annual average daily operations during the busiest month.[19] Flight tracks (paths over the ground) and flight profiles (altitude, speed, and altitude angles) along each track for each type of operation or mission were provided by the Marine Corps for its aircraft and estimated for the non-Marine Corps aircraft.

Training missions can be divided into three reporting areas: *sortie, training event,* and *operation.* Following are definitions of the three areas.

Sortie is defined as one or more aircraft proceeding on a common mission. For reporting purposes, a sortie is composed of a takeoff from a point of origin followed by a landing which results in a shutdown of the aircraft or remaining on the ground in excess of five minutes. For example, an aircraft conducts a training sortie by departing from MCAS Kaneohe Bay and landing at FARP 17 at PTA, where it remains on the ground for 30 minutes for refueling. This is counted as one sortie. The aircraft takes off to conduct a training activity supporting a Marine Corps unit at PTA. After the training is completed, the aircraft lands and spends 20

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[19] USMC estimated the busiest month would have 20% more operations than the average month.

minutes to refuel and then flies back to MCAS Kaneohe Bay and lands. This is counted as two more sorties, for a total of three sorties for the aircraft. If a second aircraft participates, then the total is six sorties (three per aircraft).

Training event is a specific phase of a sortie. During the conduct of the three sorties described above, the aircraft completed a Training and Readiness (T&R) event in support of the Marine Corps unit at PTA.

Within a sortie and training event, multiple **operations** will occur. Operations can include landings, take offs, and overflights (such as TERF routes). In the sortie example above, the flight from MCAS Kaneohe Bay to FARP 17 is counted as two operations (takeoff and landing). Over the course of time at PTA supporting the Marine Corps unit, the aircraft conducts ten more operations, which include landings and takeoff at various PTA LZs. This brings the total to 12 operations. At the completion of the training, the aircraft lands to refuel and then flies back to MCAS Kaneohe Bay for two more operations. This brings the total to 14 operations. In total, the aircraft conducted three sorties, one training event, and 14 operations.

At a minimum, each sortie to an LZ consists of two operations: an ingress operation (usually an approach which is from over the water, called "feet wet" having originated from the aircraft's main base) resulting in a landing, and an egress operation typically in reverse of the ingress. In between the ingress and egress, some aircraft conduct multiple landings while "circling" the LZ in a local traffic pattern. For purposes of this EIS, five patterns (landings) per sortie were estimated for aircraft at the applicable LZs. At airfields, each pattern was counted as two operations. The counts presented in this section and Appendix D of this EIS are numbers of landings called "landing events."

Background ambient noise levels at the other training areas are similar to those along the shoreline of Kaneohe Bay, i.e., relatively quiet environment punctuated by intermittent and audible noise events. As existing aircraft noise contours were generally not available for the training areas, 2009 operations were used to develop "baseline" contours for the LZs of interest described above. See Section 4.3 for details of aircraft operations at the training areas.

4.5.2 AFFECTED ENVIRONMENT

This section describes the affected environment associated with existing helicopter training operations for the LZs at specific training areas modeled, as described above. The existing aircraft noise environment is based on calendar year (CY) 2009 helicopter operations totaling

3,916 annual landing events as shown in Table 4-28. Approximately two percent of the operations occur during the DNL nighttime (10PM to 7AM) period.

Figure 4-1 shows representative SEL and Lmax of the primary aircraft utilizing the LZs for existing and future year operations. These noise levels are estimated for the downwind leg of the LZ pattern flight tracks with the aircraft flying at 80 knots and 300 ft (91.4 m) AGL. The CH-53 generates an SEL of approximately 97 dB and an Lmax of approximately 91 dB. Army helicopters, modeled with the SH-60B, generate SEL and Lmax approximately 9 dB less than the CH-53 as the SH-60B generates SEL and Lmax of 89 dB and 82 dB, respectively.

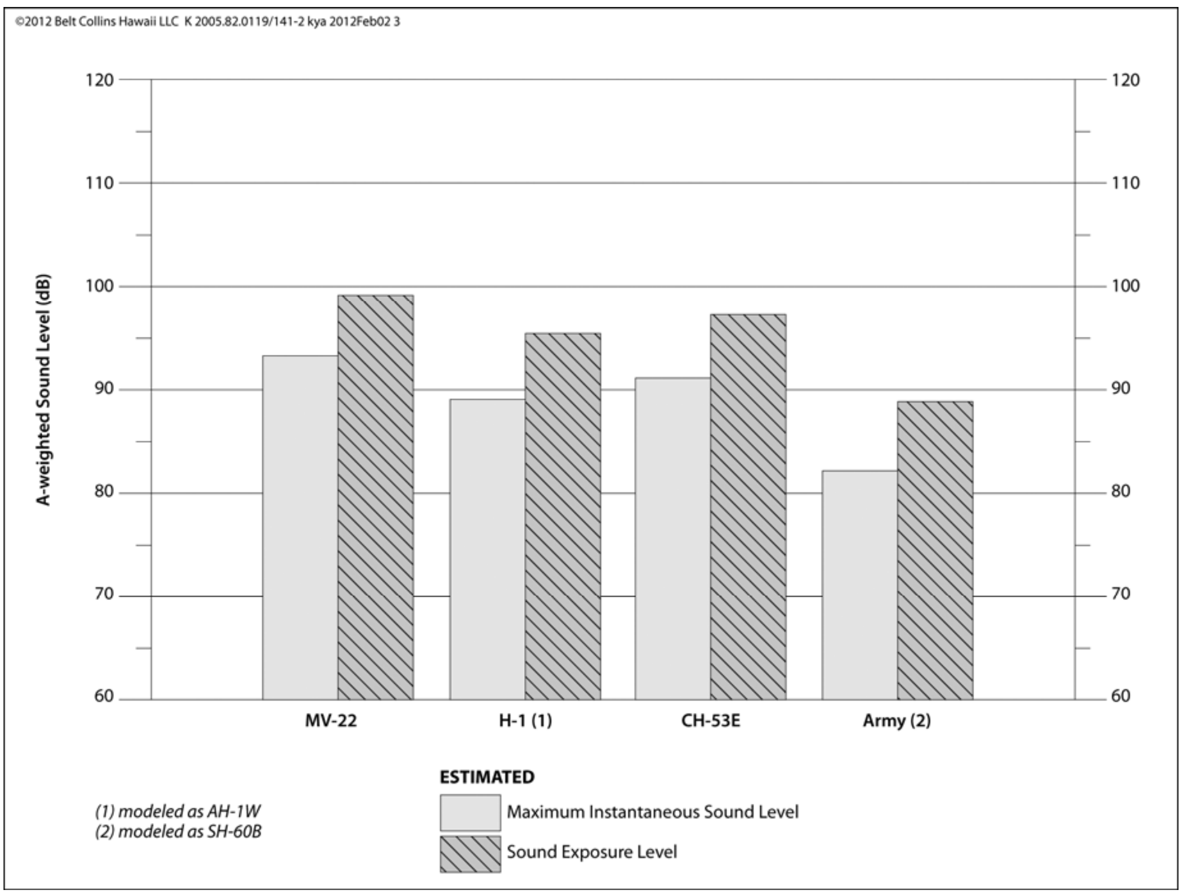


Figure 4-1. Aircraft Operations and LZs in Hawaii (downwind leg, 80 knots, 300 ft AGL)

In addition to existing helicopter training operations at specific LZs, there are requirements to fly long routes over terrain at low altitudes. These requirements are generally categorized as

Low Altitude Training (LAT). LAT activities, such as Terrain Flight (TERF), are primarily conducted within Army training areas and associated controlled airspace. The two main Army training areas in the state of Hawaii where LAT is conducted are Alert Area A-311 (which covers KTA, KLOA, and SBER) on the island of Oahu and Restricted Area R-3101 at PTA on the island of Hawaii. In these areas, training activities such as TERF involve aircraft at a minimum altitude of 50 ft (15 m) AGL. The longer LAT routes that extend into FAA-controlled airspace require a minimum altitude of 500 ft (152 m) AGL and speeds not exceeding 250 knots.

LAT activities along with flights over land to access training areas can impart sound to populations below. These overflights are characterized in this section to provide a sense of the relative changes in sound levels that may be experienced from the proposed new aircraft. The Sound Exposure Level (SEL) metric is used to characterize noise from overflights, as it includes both the maximum noise level and the lower noise levels produced during onset and recess periods of the overflight.

Table 4-28. Summary of Modeled Baseline (2009) Annual Landing Events for Applicable LZs

		Marine Corps			Other						TOTAL		
		CH-53D			Army			HIARNG					
Area	LZ	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Kalaupapa Airport	Kalaupapa Runway	250	11	261	—	—	—	—	—	—	250	11	261
Dillingham Military Reservation	Dillingham Airfield Runway	54	2	56	141	3	144	9	—	9	204	5	209
	DZ Dillingham	54	2	56	141	3	144	9	—	9	204	5	209
	Albatross (Apron)	54	2	56	141	3	144	9	—	9	204	5	209
	Blue Jay (New)	54	2	56	141	3	144	9	—	9	204	5	209
	Finch	54	2	56	141	3	144	9	—	9	204	5	209
	Rooster (Taxiway)	54	2	56	141	3	144	9	—	9	204	5	209
MCTAB	Tiger	29	1	30	—	—	—	—	—	—	29	1	30
	Noni	29	1	30	—	—	—	—	—	—	29	1	30
	Gull	58	2	60	—	—	—	—	—	—	58	2	60

Table 4-28. Summary of Modeled Baseline (2009) Annual Landing Events for Applicable LZs

		Marine Corps			Other						TOTAL		
		CH-53D			Army			HIARNG					
Area	LZ	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
	Hawk	58	2	60	—	—	—	—	—	—	58	2	60
	Owl	58	2	60	—	—	—	—	—	—	58	2	60
Kawailoa Training Area	Black	925	27	952	913	16	929	144	1	145	1,982	44	2,026
SB East Range	Ku Tree	62	2	64	62	—	62	9	—	9	133	2	135
TOTALS		1,793	60	1,853	1,821	34	1,855	207	1	208	3,821	95	3,916

Day = 7AM to 10PM. Night = 10PM to 7AM

DZ = drop zone

Currently, CH-53s conduct TERF over land designated for Army training and LAT throughout the state. Using the lowest altitudes above ground level at which these training events could occur, sound levels were estimated with computer models. The ground level SEL from a CH-53 conducting TERF at an altitude of 50 ft (15 m) AGL was estimated to be less than 119 dB (Wyle 2011). (Because TERF is conducted over designated Army training areas, exposure to such levels is unlikely and any exposure is anticipated to be substantially less.) The ground level SEL from a CH-53 conducting LAT at an altitude of 500 ft (152 m) AGL was estimated to be less than 99 dB SEL (Wyle 2011).

4.5.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

The existing aircraft noise environment at MCTAB consists of 240 annual landing events by Marine Corps CH-53D helicopters across five LZs (Tiger, Noni, Gull, Hawk, and Owl). No patterns are conducted at MCTAB. Approximately three percent of operations occur during the DNL nighttime (10PM to 7AM) period. Helicopters typically transit to the area over water and approach MCTAB from the northeast. The modeled flight tracks and flight profiles are shown in Appendix D.

For the baseline condition, no areas outside of MCTAB experience sound levels equal to or greater than 65 dB DNL.

4.5.2.2 Army Training Areas on the Island of Oahu

Kawailoa Training Area (KLOA)

The existing aircraft noise environment at KLOA consists of 2,026 annual landing events at LZ Black. Approximately two percent of operations occur during the DNL nighttime (10PM to 7AM) period. Marine Corps CH-53D and Army helicopters are the predominant users of KLOA with 47 and 46 percent of total operations, respectively.

The representative arrival, pattern, and departure flight tracks and flight profiles are shown in Appendix D. The primary approach to LZ Black is to the northeast at a heading of approximately 50 degrees east of magnetic north. This heading is used for 85 percent of the operations at KLOA. The secondary approach heading is in the opposite direction towards the southwest and is utilized for the remaining 15 percent of KLOA operations. A typical pattern consists of a racetrack-type pattern with a takeoff and landing originating and terminating at the LZ. The typical distance across the width of the "racetrack" is approximately 4,500 ft (1,372 m).

For the baseline condition, the 65 dB DNL contour extends no more than 400 ft (122 m) in any direction from the LZ.

Schofield Barracks East Range (SBER)

The existing aircraft noise environment at SBER consists of 135 annual landing events at LZ Ku Tree. Approximately five percent of operations occur during the DNL nighttime (10PM to 7AM) period. Of the total landing events from all aircraft at SBER, the Marine Corps' CH-53D and the Army's helicopters conduct approximately 47 and 46 percent of the total, respectively.

The arrival, pattern, and departure flight tracks at SBER are the same as the representative flight tracks for KLOA shown in Appendix D. A typical pattern consists of the same racetrack-type pattern as conducted at KLOA with the same approach headings. The flight profiles at SBER are very similar to the KLOA flight profiles, except that altitudes have been adjusted to compensate for differences in terrain.

For the baseline condition, aircraft noise is insufficient to generate a 65 dB DNL contour.

Dillingham Military Reservation (DMR)

The existing aircraft noise environment at DMR consists of 1,254 annual landing events across six locations (Dillingham Airfield runway, Drop Zone (DZ) Dillingham, and LZs

Albatross, Blue Jay, Finch, and Rooster). The primary users are Army helicopters conducting nearly 70 percent of total operations. Approximately two percent of operations occur during the DNL nighttime period.

The primary approach to the DMR LZs is to the east. Arrival, pattern, and departure flight tracks at DMR are the same as the representative flight tracks for KLOA shown in Appendix D, except that the orientation is rotated so the primary approach headings are to the east and the secondary approach headings are to the west. The flight profiles at DMR are very similar to the KLOA flight profiles, except that altitudes have been adjusted to compensate for differences in terrain.

For the baseline condition, no areas outside of DMR experience a DNL equal to or greater than 65 dB.

4.5.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

As concluded from the preliminary noise study referenced in Section 4.5.1, aircraft operations are not in proximity to residential or other noise sensitive land uses to warrant noise modeling and analysis, i.e., noise impacts are not anticipated. Hence, no further evaluation of existing conditions for aircraft noise was conducted at PTA.

4.5.2.4 Pacific Missile Range Facility (PMRF), Island of Kauai

As concluded from the preliminary noise study referenced in section 4.5.1, aircraft operations are not in proximity to residential or other noise sensitive land uses to warrant noise modeling and analysis, i.e., noise impacts are not anticipated. Hence, no further evaluation of existing conditions for aircraft noise was conducted at PMRF.

4.5.2.5 Training Areas on the Islands of Molokai and Maui

Kalaupapa Airport is currently used for both general aviation and for Marine Corps aviation training. For this study only the Marine Corps training events were modeled; these consist of 261 annual landing events by the CH-53D to the runway. Approximately four percent of operations occur during the DNL nighttime (10PM to 7AM) period.

The arrival, pattern, and departure flight tracks at Kalaupapa Airport are the same as the representative flight tracks for KLOA shown in Appendix D, except that the orientation is rotated so primary approach headings follow the runway towards the northeast and the secondary approach headings follow the runway towards the southwest. The flight profiles at Kalaupapa Airport are very similar to the KLOA flight profiles, except that altitudes have been adjusted to compensate for differences in terrain.

For baseline conditions, no areas outside of Kalaupapa Airport experience a DNL equal to or greater than 65 dB, as shown in Figure 4-2.

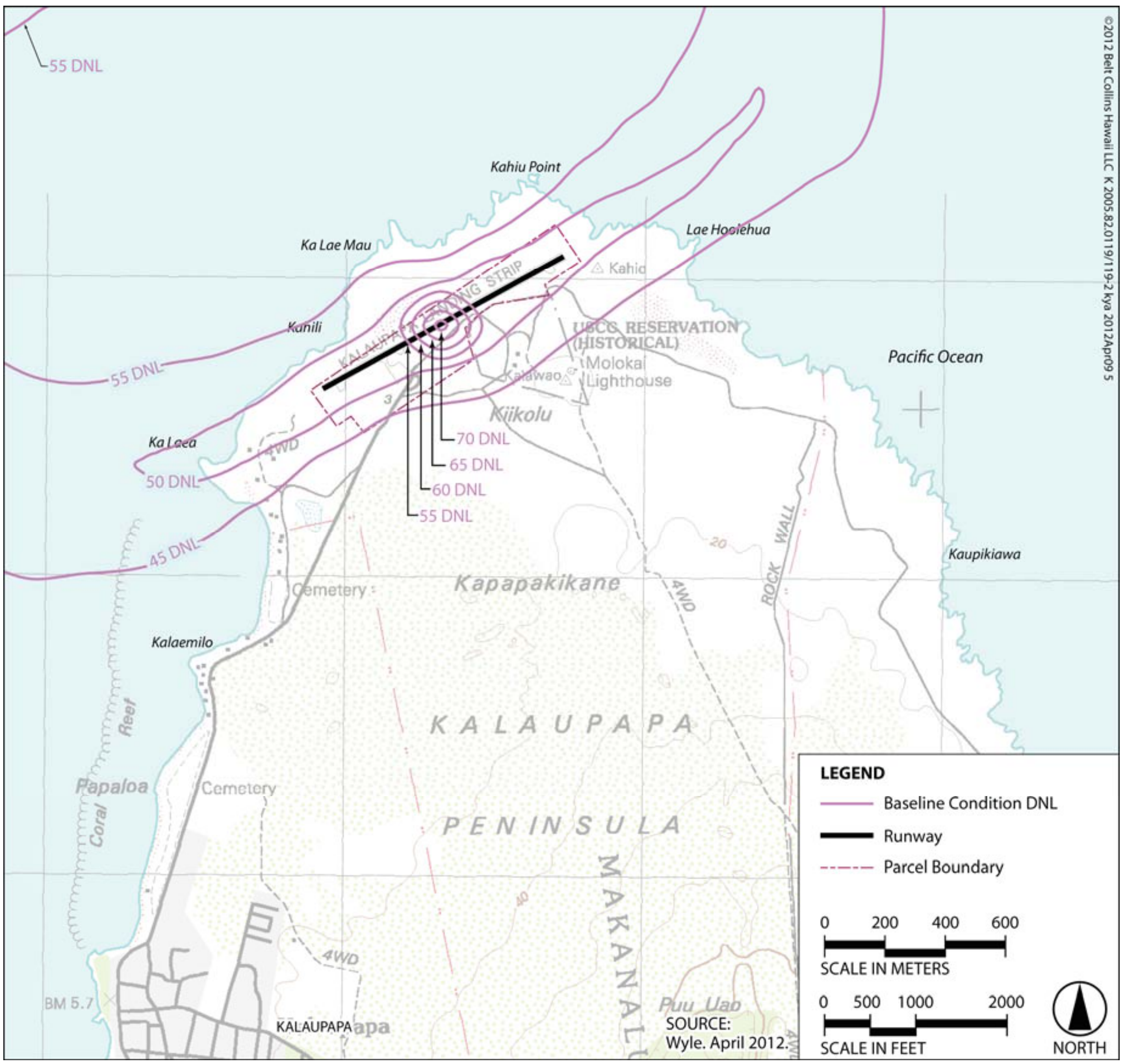


Figure 4-2. Aircraft DNL Contours for Baseline LZ Operations at Kalaupapa Airport

For MTSF on the island of Molokai and HIARNG on the island of Maui, aircraft operations are not in proximity to residential or other noise sensitive land uses to warrant noise modeling and analysis for the EIS, i.e., noise impacts are not anticipated. Therefore, evaluations of existing conditions for aircraft noise at these locations were not conducted.

4.5.3 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

Construction projects at MCTAB, PTA, and MTSF under Alternative A or B, summarized in Table 4-1, would include improvements of existing facilities. Activities would not impact off-site civilian populations and, therefore, are not further evaluated. Furthermore, activities would be of relatively short duration (approximately 1 to 3 months). For these reasons, no significant impact on noise would occur with the proposed action and no mitigation is required.

With No Action, no changes and no impacts would occur. No mitigation is required.

Operational Impacts

The proposed action (Alternative A or B) would consist of 9,900 annual landing events statewide, with approximately seven percent occurring during the DNL nighttime (10PM to 7AM) period as shown in Table 4-29. This includes the addition of nearly 1,900 MV-22 and 2,100 AH-1/UH-1 landing events. Approximately 10 percent of the MV-22 events and 18 percent of the AH-1/UH-1 events would occur during the DNL nighttime (10PM to 7AM) period. Under the proposed action, all training events would remain at the No Action Alternative tempo.

As introduced in Section 4.5.1, specific LZs/training areas have been modeled and are discussed. Figure 4-1 shows representative SEL and Lmax of the MV-22 and H-1 aircraft along with the primary aircraft utilizing the LZs for existing operations. These noise levels are estimated for the downwind leg of the LZ pattern flight tracks with the aircraft flying at 80 knots and 300 ft (91.4 m) AGL. The MV-22 and H-1 would generate SEL up to 99 dB and Lmax up to 93 dB. These levels would be only 2 dB greater than the SEL and Lmax generated by existing CH-53 aircraft (97 dB SEL and 91 dB Lmax). Changes in single-event sound levels (i.e., Lmax) of less than 3 dB are not typically noticeable by the average human ear. To address the overflights associated with LAT and ingress/egress to specific LZs/training areas, the proposed action aircraft have been modeled and findings follow.

Table 4-29. Summary of Modeled Alternative A/B (2018) Annual Landing Events for Applicable LZs

		USMC									Other						TOTAL		
		CH-53E			MV-22			AH/UH-1			Army			HIARNG					
Area	**LZ**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**
Kalaupapa Airport	Kalaupapa Runway	107	5	112	—	—	—	1,037	351	1,388	—	—	—	—	—	—	1,144	356	1,500
Dillingham Military Reservation	Dillingham Airfield Runway	24	1	25	108	6	114	70	3	73	455	9	464	9	—	9	666	19	685
	Dillingham DZ	24	1	25	108	6	114	70	3	73	455	9	464	9	—	9	666	19	685
	Albatross (Apron)	24	1	25	108	6	114	70	3	73	455	9	464	9	—	9	666	19	685
	Blue Jay (New)	24	1	25	108	6	114	70	3	73	455	9	464	9	—	9	666	19	685
	Finch	24	1	25	108	6	114	70	3	73	455	9	464	9	—	9	666	19	685
	Rooster (Taxiway)	24	1	25	108	6	114	70	3	73	455	9	464	9	—	9	666	19	685
MCTAB	Tiger	13	—	13	14	1	15	15	1	16	—	—	—	—	—	—	42	2	44
	Noni	13	—	13	14	1	15	15	1	16	—	—	—	—	—	—	42	2	44
	Gull	26	1	27	27	1	28	30	1	31	—	—	—	—	—	—	83	3	86
	Hawk	26	1	27	27	1	28	30	1	31	—	—	—	—	—	—	83	3	86
	Owl	26	1	27	27	1	28	30	1	31	—	—	—	—	—	—	83	3	86
A311 Kawailoa Training Area	Black	411	12	423	250	112	362	97	3	100	2,036	36	2,072	144	1	145	2,938	164	3,102
A311 SB East Range	Ku Tree	28	—	28	17	8	25	7	—	7	126	2	128	9	—	9	187	10	197
TOTAL		794	26	820	1,674	195	1,869	1,681	377	2,058	4,892	92	4,984	207	1	208	9,248	691	9,939

Day = 7AM to 10PM. Night = 10PM to 7AM

The proposed MV-22 (in TERF) could impart an SEL of 118 dB at its lowest altitude above ground level (50 ft or 15 m), which is comparable to the CH-53E (existing CH-53D aircraft will be replaced with CH-53E aircraft) that is estimated at 119 dB. Because TERF is conducted over designated Army training areas, exposure to such levels is unlikely and any exposure is anticipated to be substantially less. When conducting LAT in FAA-controlled airspace, the MV-22 could impart an SEL of 97 dB at its lowest altitude above ground level (500 ft or 152 m), which is 3 dB greater than the existing C-130. A change of 3 dB is generally detectible to the human ear.

The proposed AH/UH-1 aircraft (in TERF) could impart an SEL of 117 dB at its lowest altitude above ground level (50 ft or 15 m), which is slightly less (within 2 dB) but comparable to the MV-22 and the CH-53E. Because TERF is conducted over designated Army training areas, exposure to such levels is unlikely and any exposure is anticipated to be substantially less. When conducting LAT in FAA-controlled airspace, the AH/UH-1 could impart an SEL of 96 dB at its lowest altitude above ground level (500 ft or 152 m), which would be less than the CH-53E at 99 dB.

The No Action Alternative would consist of 6,337 annual landing events statewide, with approximately two percent occurring during DNL nighttime (10PM to 7AM) period as shown in Table 4-30. This accounts for expected changes in operations of the USMC CH-53 (and the transition from the CH-53D to the CH-53E) and the Army helicopters. Under the No Action Alternative, no MV-22 or AH-1/UH-1 operations would occur in the training areas analyzed in this EIS.

Table 4-30. Summary of Modeled No Action Alternative (CY2018) Annual Landing Events for Applicable LZs

		USMC			Other						TOTAL		
		CH-53E			Army			HIARNG					
Area	LZ	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Kalaupapa Airport	Kalaupapa Runway	107	5	112	—	—	—	—	—	—	107	5	112
Dillingham Military Reservation	Dillingham Airfield Runway	24	1	25	455	9	464	9	—	9	488	10	498
	Dillingham DZ	24	1	25	455	9	464	9	—	9	488	10	498
	Albatross (Apron)	24	1	25	455	9	464	9	—	9	488	10	498
	Blue Jay (New)	24	1	25	455	9	464	9	—	9	488	10	498
	Finch	24	1	25	455	9	464	9	—	9	488	10	498
	Rooster (Taxiway)	24	1	25	455	9	464	9	—	9	488	10	498
MCTAB	Tiger	13	—	13	—	—	—	—	—	—	13	—	13

Table 4-30. Summary of Modeled No Action Alternative (CY2018) Annual Landing Events for Applicable LZs

		USMC			Other						TOTAL		
		CH-53E			Army			HIARNG					
Area	**LZ**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**
	Noni	13	—	13	—	—	—	—	—	—	13	—	13
	Gull	26	1	27	—	—	—	—	—	—	26	1	27
	Hawk	26	1	27	—	—	—	—	—	—	26	1	27
	Owl	26	1	27	—	—	—	—	—	—	26	1	27
A311 Kawailoa Training Area	Black	411	12	423	2,036	36	2,072	144	1	145	2,591	49	2,640
A311 SB East Range	Ku Tree	28	—	28	126	2	128	9	—	9	163	2	165
TOTAL		794	26	820	4,892	92	4,984	207	1	208	5,893	119	6,012

Day = 7AM to 10PM. Night = 10PM to 7AM

Marine Corps Training Area Bellows (MCTAB)

Under the proposed action (Alternative A or B), the aircraft noise environment at MCTAB would consist of approximately 350 annual landing events, with four percent occurring during the DNL nighttime (10PM to 7AM) period. The predominant aircraft would be the AH-1/UH-1, CH-53, and MV-22 with 36, 33, and 31 percent of the total operations, respectively.

The AH-1/UH-1 would conduct an estimated 125 of the annual landing events at MCTAB, with approximately four percent occurring during the DNL nighttime (10PM to 7AM) period. All AH-1/UH-1 training at MCTAB would be conducted in the same manner as the existing helicopters utilizing the same flight tracks and very similar flight profiles. Consistent with baseline conditions, no pattern events would be conducted by the AH-1/UH-1 helicopters at MCTAB.

The MV-22 would conduct an estimated 114 landing events at MCTAB, with approximately four percent occurring during the DNL nighttime (10PM to 7AM) period. The MV-22 flight tracks at MCTAB would be very similar to those of existing helicopters, but about 500 ft (152 m) wider. The MV-22 flight tracks are shown in Appendix D. Consistent with existing helicopter operations, no pattern events would be conducted by the MV-22 at MCTAB.

For the proposed action, no areas outside of MCTAB would experience sound levels equal to or greater than 65 dB DNL, which is similar to the No Action Alternative.

The No Action Alternative would consist of an estimated 147 operations by the CH-53, a reduction of 39 percent from the baseline condition. Similar to the baseline condition, no areas outside of MCTAB would experience sound levels equal to or greater than 65 dB DNL.

Kawailoa Training Area (KLOA)

For the proposed action (Alternative A or B), nearly 3,100 annual landing events would occur at LZ Black at KLOA, with approximately five percent occurring during the DNL nighttime period. The primary user would continue to be Army helicopters which represent 67 percent of total operations.

The AH-1/UH-1 would conduct 100 of the annual landing events at KLOA, with approximately three percent occurring during the DNL nighttime (10PM to 7AM) period. The AH-1/UH-1 training at KLOA would be conducted in the same manner as existing Army helicopters utilizing the same flight tracks and very similar flight profiles.

The MV-22 would conduct 362 landing events at KLOA, with approximately 31 percent occurring during the DNL nighttime (10PM to 7AM) period. The MV-22 training at KLOA would be similar to existing helicopters, except that the flight tracks and flight profiles are unique to the MV-22. Representative MV-22 flight tracks and flight profiles are shown in Appendix D.

For the proposed action, the 65 dB DNL contour would not extend more than 1,000 ft (305 m) in any direction from the LZ, an increase of approximately 600 ft (183 m) from the baseline condition and the No Action Alternative. This increase in areal extent of the 65 db DNL contour would remain within KLOA and continue to be compatible with affected land use.

The No Action Alternative would consist of an estimated 2,809 operations by the CH-53 and the Army helicopters, an increase of 39 percent from the baseline condition. Similar to the baseline condition, the 65 dB DNL contour would not extend more than 400 ft (122 m) in any direction from the LZ, remaining within the training area.

Schofield Barracks East Range (SBER)

For the proposed action (Alternative A or B), fewer than 200 annual landing events would occur in the SBER at LZ Ku Tree, with approximately five percent occurring during the DNL nighttime (10PM to 7AM) period. The primary user would continue to be Army helicopters representing 65 percent of total operations.

The AH-1/UH-1 would conduct approximately seven of the annual landing events at SBER, with none occurring during the DNL nighttime (10PM to 7AM) period. The MV-22 would conduct an estimated 25 landing events per year at SBER, with approximately 32 percent occurring during the DNL nighttime period. Both the AH-1/UH-1 and the MV-22 flight tracks and flight profiles would be very similar to the representative tracks and profiles modeled at KLOA and shown in Appendix D. Minor differences would be changes in altitude to compensate for differing terrain.

For the proposed action, the 65 dB DNL contour would not extend more than 200 ft (61 m) from LZ Ku Tree, which is 200 ft (61 m) greater in areal extent than the baseline condition and the No Action Alternative. The 65 dB DNL contour would remain within SBER and continue to be compatible with affected land use.

The No Action Alternative would consist of an estimated 176 operations by the CH-53 and the Army helicopters, an increase of 22 percent from the baseline condition. Similar to the baseline condition, aircraft noise is insufficient to generate a DNL of 65 dB.

Dillingham Military Reservation (DMR)

For the proposed action (Alternative A or B), approximately 4,100 annual landing events would occur among six LZs in the DMR. Approximately three percent would occur during the DNL nighttime (10PM to 7AM) period. The primary user would continue to be Army helicopters representing 68 percent of total operations.

The AH-1/UH-1 would conduct approximately 440 of the annual landing events at DMR, with approximately four percent occurring during the DNL nighttime (10PM to 7AM) period. The MV-22 would conduct 684 landing events at DMR, with approximately five percent occurring during the DNL nighttime period. Both the AH-1/UH-1 and the MV-22 flight tracks and flight profiles would be very similar to the representative tracks and profiles modeled at KLOA and shown in Appendix D. Minor differences would be changes in altitude to compensate for differing terrain.

For the proposed action, no areas outside of the DMR would experience DNL greater than or equal to 65 dB.

The No Action Alternative would consist of approximately 3,000 operations by the CH-53 and the Army helicopters, an increase of 143 percent from the baseline condition. Similar to the baseline condition, no areas outside of DMR would experience a DNL equal to or greater than 65 dB.

Kalaupapa Airport

Under the proposed action (Alternative A or B), 1,500 annual landing events would occur at the Kalaupapa runway, with approximately 24 percent during the DNL nighttime (10PM to 7AM) period. The primary user would be the Marine Corps with its AH-1/UH-1 representing 93 percent of total operations. The AH-1/UH-1 would conduct nearly 1,400 of the annual landing events at Kalaupapa, with approximately 25 percent occurring during the DNL nighttime period. The AH-1/UH-1 flight tracks would be very similar to the representative tracks and profiles modeled at KLOA and shown in Appendix D, except that only approaches, patterns, and departures over the ocean or the runway would be used. Flight profiles would also be very similar to the representative profiles modeled at KLOA; minor differences would be changes in altitude to compensate for differing terrain.

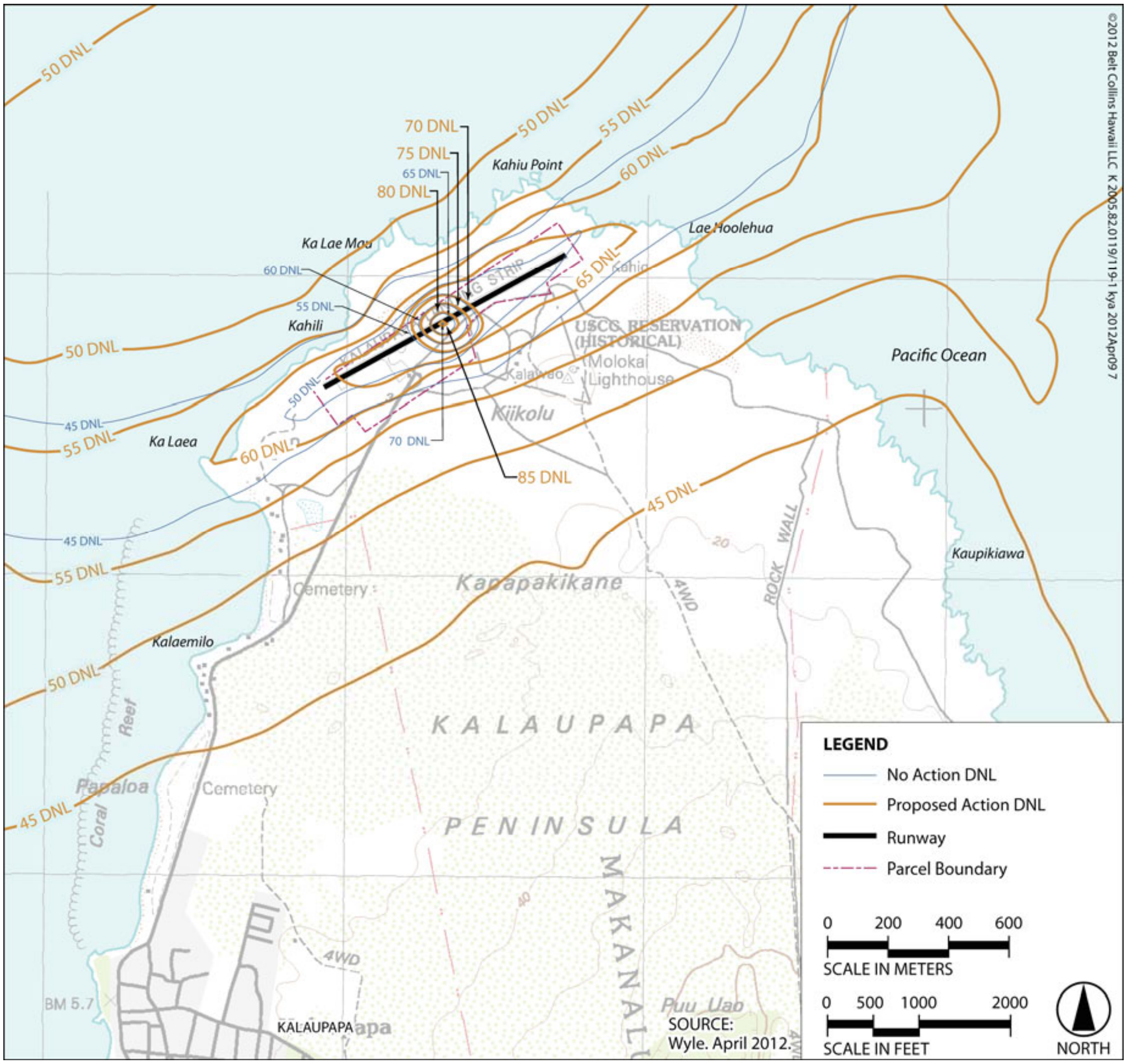
For the proposed action, the 65 dB DNL contour would be centered on the runway less than 4,000 ft (1,219 m) in length and 800 ft (244 m) in width as shown in Figure 4-3. While the areal extent of the 65 dB DNL contour is greater than that of the baseline condition and the No Action Alternative, DNL levels would continue to be compatible with the affected land use.

The No Action Alternative would consist of approximately 157 operations by the CH-53 helicopter, a decrease of 40 percent from the baseline condition. Similar to the baseline condition, no areas outside of the Kalaupapa Airport boundary would experience a DNL equal to or greater than 65 dB as shown in Figure 4-3.

4.6 GEOLOGY, SOILS, AND TOPOGRAPHY

4.6.1 INTRODUCTION

This section describes the general geology, soils, and topography within the proposed training areas. Potential impacts would be minimized with the compliance of applicable regulations and building codes, including the National Pollutant Discharge Elimination System (NPDES) permit program, International Building Code (IBC), and Unified Facilities Criteria (UFC). The ROI for each training area consists of the area proposed for aviation activities and facility improvements, if any.



1
2 **Figure 4-3. Aircraft DNL Contours for Alternative A/B and No Action Alternative: Operations at Kalaupapa Airport**

4.6.2 AFFECTED ENVIRONMENT

4.6.2.1 Marine Corps Training Area Bellow (MCTAB), Island of Oahu

MCTAB lies within the windward lowlands of Oahu. The LZs proposed for use by the squadrons are relatively level with ground elevations on the order of 80 ft (24 m) above mean sea level (msl) (Boeing 2011b). Keolu Hills are located to the northwest and consist of basalt rock hills with elevations up to about 400 ft (122 m) above mean sea level (msl) (Drigot, Wilcox, and Druin 2001). See Figure 2-8.

Based on the U.S. Department of Agriculture, Soil Conservation Service (USDA SCS 1972), surface soils consist primarily of fill land (FL), and Jaucas sand (JaC). Coral outcrops (CR) and Mokuleia clay (Ms and Mt) have also been mapped at the LZs. The following presents a summary of soil types that have been mapped at the LZs:

- Fill land (FL) – Fill land consists of areas filled with material dredged from the ocean or hauled from nearby areas.
- Jaucas sand (JaC) – The Jaucas series consist of excessively drained, calcareous soils developed in wind- and water-deposited sand from coral and seashells. The sand has rapid permeability and very slow to slow runoff. The hazard of water erosion is slight, but wind erosion is a severe hazard where vegetation is limited.
- Coral outcrops (CR) – Coral outcrop consists of coral or cemented calcareous sand formed in shallow ocean water during the time the ocean stand was at a higher level.
- Mokuleia clay (Ms and Mt) - The Mokuleia series consist of well-drained soils along the coastal plains. The clay was formed in recent alluvium and deposited over coral sand. Permeability is moderate in the surface layer and rapid in the underlying sand subsoil layer. Runoff is very slow, and the erosion hazard is no more than slight.

4.6.2.2 Army Training Areas on the Island of Oahu

Kahuku Training Area (KTA). KTA lies on the northern side of the Koolau Mountain Range (Figure 2-9). Elevations at KTA range from near sea level to about 1,860 ft (567 m) above msl. The topography varies from relatively flat on the coastal plains to nearly vertical bluffs and stream drainage basins on the cliffs to the east (Army HQ 2008b). The ground elevation at DZ Kanes is approximately 410 ft (125 m) above msl; elevations at the LZs vary from about 564 ft (172 m) to 1,043 ft (318 m) above msl (Boeing 2011b).

Soil types mapped at KTA include: Kapaa Silty Clay, Kemoo-Badland Complex, Kaena Very Stony Clay, Kawaihapai Stony Clay Loam, Keemo Silty Clay, Paumalu Silty Clay, and Paumalu-Badland Complex. These soils generally consist of well-drained silty clays in the upland areas of Oahu. Soils were developed in material weathered from basic igneous rock or in old alluvium and colluvium derived from basic igneous rock. Shrink-swell potential ranges from low to moderate. Permeability is moderate to rapid, runoff is slow to medium, and erosion hazard is slight to moderate. The Badland Complex series soils represent nearly barren land due to wind and water erosion. As a result, runoff in these areas is rapid, and the erosion hazard is very severe (SCS 1972).

Kawailoa Training Area (KLOA). KLOA is located to the north of SBER and on the northwestern slopes of the Koolau Mountain Range (Figure 2-9). Ground elevations at KLOA vary from approximately 2,600 ft (792 m) above msl at the crest of the mountain range to approximately 1,000 ft (305 m) in the lower western portion. The topography at KLOA is rugged and extreme, with steep-sided and deep valleys and ravines. The majority of the land within KLOA is densely vegetated with slopes in excess of 20 percent (Army HQ 2008b).The LZs within KLOA are generally located at the top of ridges or on plateaus. Ground elevations at the LZs vary from about 912 ft (278 m) to 1,730 ft (527 m) above msl (Boeing 2011b).

Based on the USDA SCS, soil types mapped at the KLOA LZs include Leilehua silty clay (Le series) and Helemano silty clay (HLMG). The mapping also includes pockets of Paaloa silty clay (PaC) and Wahiawa silty clay (WaA). The Leilehua series consist of well-drained soils developed in material weathered from basic igneous rock. The Helemano series consist of well-drained soils on alluvial fans and colluvial slopes on the sides of gulches. The Leilehua and Helemano silty clays have moderately rapid permeability characteristics. Runoff varies from slow to rapid, and erosion hazard varies from slight to very severe. The soils' shrink-swell potential varies from low to moderate.

Schofield Barracks East Range (SBER). SBER lies to the southeast and east of Wahiawa in central Oahu. SBER generally extends from the southeastern side of Wahiawa to the western slopes of the Koolau Mountain Range (Figure 2-9). Surface conditions are variable, with the topography of the western portion of SBER gently to moderately sloping, while the eastern portions consist of the steep slopes and rugged terrain of the Koolau Mountain Range.

Ground elevations near the lower reaches of SBER at LZ Lower 36 and LZ Upper 36 are approximately 1,102 ft (336 m) and 1,191 ft (363 m) above msl, respectively. LZ Ku Tree, LZ Italy, LZ Lower 72, and LZ Upper 72 lie on the top of ridges and have ground elevations on the order of 1,315 ft (401 m), 1,292 ft (394 m), and 1,275 ft (389 m), and 1,402 ft (427 m) above msl, respectively (Boeing 2011b).

Based on the USDA SCS, the soil types mapped include Leilehua silty clay (LeB and LeC) and Paaloa silty clay (PbC). The mapping also includes rock land (rRK). The Leilehua and Paaloa series consist of well-drained soils developed in material weathered from basic igneous rock. These soils have moderately rapid permeability characteristics. Runoff is slow, and the erosion hazard is slight. The soils' shrink-swell potential varies from low to moderate. Rock land consists of approximately 25 to 90 percent exposed rock surfaces with pockets of very shallow surface soils.

Dillingham Military Reservation (DMR). DMR is situated on Oahu's Waialua Plain and extends inland to the foot of the Waianae Mountain Range (Figure 2-9). Ground elevations range from near sea level on the northern boundary to 2,000 ft (610 m) above msl near the southern boundary. Ground elevations at Dillingham Airfield and the LZs range from about 10 ft (3 m) to 44 ft (13 m) (Boeing 2011b).

Soils at DMR consist of beach sand deposits with various mixtures of finer and coarser sediments. Most of the area is underlain by Jaucas sand, which has been disturbed or filled to construct the airstrip, roads, and building sites (Army HQ 2008b). Based on the USDA SCS, the soil types mapped consist primarily of fill land (FL), and Jaucas sand (JaC). Lualualei silty clay (LuA) and Haleiwa silty clay (HeA) have also been mapped at the airfield and LZs. The following soil types are mapped at DMR: Fill land (FL), consisting of areas filled with material dredged from the ocean or hauled from nearby areas; Jaucas sand (JaC), consisting of excessively drained, calcareous soils developed in wind- and water-deposited sand from coral and seashells; and Lualualei silty clay (LuA) and Haleiwa silty clay (HeA), consisting of well-drained soils on the coastal plains and alluvial fans developed in alluvium and colluviums. Jaucas sand has rapid permeability and very slow to slow runoff. The hazard of water erosion is slight, but wind erosion is a severe hazard where vegetation is limited. For Lualualei silty clay and Haleiwa silty clay, permeability and runoff are slow, and the erosion hazard is no more than slight.

4.6.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

PTA lies within the Humuula Saddle between Mauna Kea and Mauna Loa (Figure 2-10). Presently, Mauna Kea is considered a dormant volcano, while Mauna Loa remains active having erupted 39 times since 1832. Mauna Loa most recently erupted in 1984. Elevations at PTA range from approximately 4,030 ft (1,228 m) near the northwestern boundary to about 8,650 ft (2,637 m) above msl on the slopes of Mauna Loa (25th ID[L] n.d.).

Generally, soils are poorly developed at PTA, as the island of Hawaii is the youngest of the Hawaiian Islands. The USDA has broadly classified the soils of PTA in terms of ten lava flow soil types: Lava flows aa, Lava flows pahoehoe, Cinder land, Huikau extremely stony loamy sand 12 to 20 percent slopes, Kekake extremely rocky muck 6 to 20 percent slopes, Keekee loamy sand 0 to 6 percent slopes, Kilohana loamy fine sand 12 to 20 percent slopes, Mawae extremely stony muck 6 to 20 percent slopes, Rock land, and Very stony land. Soil erosion is not significant due to the presence of rock at or near ground surface. The dry climate and lack of permanent streambeds also reduce the significance of erosion at PTA. Deep soils are found in the northern and western portion (e.g., Keamuku parcel) of the installation. Gullies and eroded trails are present in these areas indicating that soil erosion is significant (25th ID[L] n.d.).

4.6.2.4 Pacific Missile Range Facility (PMRF), Island of Kauai

PMRF is located on the Mana Plain on the west side of Kauai (Figure 2-11). The Mana Plain is a low-lying coastal terrace composed of earthy and marly lagoon deposits, calcareous beach and dune sand, and alluvium (Macdonald and Abbott 1970). PMRF has a generally flat topography with a nominal elevation of 15 ft (5 m) above msl. Low beach barrier dunes, mildly undulating blanket sands, and the more prominent Nohili Dunes at the northern end of the range form local relief. The highest natural elevation point at the range is at Nohili Dunes, rising approximately 100 ft (31 m) above msl (Navy 2008a).

Soils mapped at PMRF consist primarily of loose sand. The predominant soil type is Jaucas loamy fine sand (JfB), 0 to 8 percent slopes. Jaucas sand occurs at old beaches and on windblown sand deposits. The Jaucas series consist of excessively drained, calcareous soils developed in wind- and water-deposited sand from coral and seashells. The sand has rapid permeability and very slow to slow runoff. The hazard of water erosion is slight, but wind erosion is a severe hazard where vegetation is limited (SCS 1972).

4.6.2.5 Training Areas on the Islands of Molokai and Maui

Molokai Training Support Facility (MTSF). Topography at MTSF is relatively level with ground elevations ranging from approximately 130 to 140 ft (40 to 43 m) above msl (Boeing 2011a).Soils are the Molokai silty clay loam, MuA (0 to 3 percent slopes), and MuB (3 to 7 percent slopes). Runoff is slow to medium, and erosion hazard is slight to moderate (SCS 1972).

Kalaupapa Airport. Kalaupapa Airport is located at the north end of Kalaupapa Peninsula (Figure 2-12). The geology of the peninsula is the result of volcanic activity of Kauhako Crater, located about two miles (3.2 km) south of the airport. Soils in the vicinity of Kalaupapa Airport are: Rock Outcrop (rRO), Rock Land (rRK), Jaucus Sand (JaC), and Kalaupapa very rocky silty clay loam (KFID) (SCS 1972). The area proposed for use by the VMM and HMLA squadrons is the existing paved airfield that lies above the soils.

HIARNG Facility. The HIARNG Facility is located between Puunene and Kihei near an abandoned airport on the east side of Mokulele Highway (Figure 2-13). Topography at the site is relatively flat with an approximate ground elevation of 70 ft (21 m) above msl (Boeing

2011a). Soil types mapped at the HIARNG Facility include Ewa cobbly silty clay loam (EcA), Pulehu cobbly silt loam (PrA), and Waiakoa extremely stony silty clay loam, 3 to 25 percent slopes eroded (WID2). The Ewa and Pulehu soil series have moderate permeability, slow runoff rates, and slight erosion hazards. Waiakoa extremely stony silty clay (eroded) has a medium runoff rate and a severe erosion hazard (HIARNG 2001).

4.6.3 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

Improvements to existing facilities are proposed at MCTAB, PTA, and MTSF under Alternative A or B. Existing landing zones to be improved are located on suitable terrain for the proposed training activities. Improvements requiring grading work would be completed in compliance with geotechnical engineering recommendations incorporated into the project designs. Design and construction of the improvements would be completed in compliance with existing regulatory requirements, e.g., the NPDES permit program. BMPs would be implemented for erosion and sediment control prior to and during construction.

Given compliance with BMPs, no significant impacts on topography, geology, or soils would occur during construction activities, and no additional mitigation is required. With No Action, no construction impacts would occur and no mitigation is required.

Operational Impacts

The MV-22 aircraft's proprotors generate downwash during vertical take-offs and landings (see Appendix F-2). The potential area of MV-22 downwash effect is within a 350-ft (107-m) radial area measured from the aircraft's landing point. As such, the potential area of MV-22 downwash effect could extend 350 ft (107 m) beyond the landing zone boundary. At paved landing zones, no soil erosion effects are expected, and no mitigation is required. At unpaved landing zones, there is a potential for soil erosion due to aircraft downwash.

Unpaved landing zones are located at the Army's Oahu training areas and at PTA. Erosion due to MV-22 downwash is less likely at PTA, where soils are mainly rocky and poorly developed. Erosion from downwash is more likely at SBER and certain parts of KLOA, where soils have relatively high erosion potential. Any erosion would be localized within the 350-ft (107-m) radial area at the LZ. In conjunction with the range manager, the operators would monitor conditions at selected LZs with the highest risk of soil erosion. Should field observations verify that erosion is occurring, the Marine Corps would work with the range manager to implement appropriate repairs or other maintenance actions (e.g., use of other LZs with less erosion potential and/or improvements to LZs to minimize erosion)., With the No Action Alternative, no operational impacts would occur and no mitigation is required.

4.7 DRAINAGE, HYDROLOGY, AND WATER QUALITY

4.7.1 INTRODUCTION

Section 3.7.1 describes the evaluation of drainage, hydrology, and water quality that are applicable to the proposed training areas. The ROI for each training area consists of the area proposed for LZ improvements and aviation activities, as well as receiving waters within each watershed.

4.7.2 AFFECTED ENVIRONMENT

4.7.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

MCTAB lies within the windward lowlands of Oahu where the climate is mild throughout the year. The median annual rainfall is approximately 40 inches (in) (102 centimeters [cm]) (MCBH 2006b).MCTAB is in the Waimanalo watershed bounded by the Koolau Range to the southwest and the Aniani Nui – Waimanalo – Kaiwa Ridge lines to the northwest. As shown in Figure 2-8, the eastern boundary of MCTAB is bordered by Waimanalo Bay. There are two streams at MCTAB, Waimanalo Stream (perennial) and Inoaole Stream (intermittent). Both streams enter the ocean at Bellows Beach (Drigot, Wilcox, and Druin 2001). Much of the land at MCTAB is open with only a small percent covered by buildings, roads, and runways. Storm water runoff moves across impermeable hardstand in sheet flow to surrounding unpaved areas, where it either infiltrates into the soil or continues overland to streams, ponds, or natural depressions.

The nearshore waters of Waimanalo Bay are designated Class A marine waters, protected for recreational purposes and aesthetic enjoyment, under *Title 11 Hawaii Administrative Rules, Department of Health, Chapter 54 Water Quality Standards.* The inland waters surrounding MCTAB are designated as Class 2, protected for recreational purposes, to support and propagate aquatic life, and for agricultural and industrial water supplies, shipping, and navigation (OEP 1987c).

Low level brackish groundwater (250 to 1,000 milligrams per liter [mg/l] chlorides) at MCTAB is generally found at or below mean sea level (msl) in marine sedimentary materials and alluvium along the coastline. Aquifer classification for the coastal area is unconfined basal in sedimentary soils and brackish (Mink and Lau 1990a). Basal is fresh water in contact with seawater; unconfined is where the water table is the upper surface of the saturated aquifer.

4.7.2.2 Army Training Areas on the Island of Oahu

Kahuku Training Area (KTA) and Kawailoa Training Area (KLOA). The average annual rainfall at these training areas ranges from 40 to 50 in (102 to 127 cm) near the coast to 150 in (381 cm) at the summit of the Koolau Mountains (Figure 2-9). KTA, which overlies the ridge of the Koolau Mountain Range, contains portions of four watersheds: Paumalu, Kawela, Oio, and Malaekahana. The western side of KTA is in the Kawailoa aquifer system of the north hydrologic sector. The eastern side of KTA is in the northern end of the Koolauloa aquifer system of the windward hydrologic sector. KLOA sits in the Kawailoa watershed that is a narrow east-west trending strip of land, north of Pu Kapu that does not have any surface outflow but probably drains below the surface to the adjacent watersheds. The off-shore receiving marine waters for both KTA and KLOA are designated Class A marine waters. No impaired water bodies [listed per Clean Water Act Section 303(d)] have been identified in the vicinity of the subject LZs.

The LZs proposed for use by the squadrons are on higher ground on ridge plateaus where storm runoff is locally generated, discharging into adjacent gullies and flowing to the coastline.

Groundwater occurrence is generally classified as unconfined basal with low salinity (<250 mg/l chlorides) in horizontally extensive lavas (Mink and Lau 1900a). Groundwater depth information is generally lacking for KTA. Groundwater in the Kawailoa aquifer systems is thought to drain northwest toward the Waimea or leeward coast (Army HQ 2008b).

Schofield Barracks East Range (SBER). The mean annual rainfall at SBER varies from about 200 in (508 cm) on the crest of the Koolau Range to about 40 in (102 cm) near Wahiawa and WAAF.

As shown in Figure 2-9, SBER extends to the crest of the Koolau Range, which has the highest rainfall on Oahu. The majority of SBER lies within one watershed, the Kaukonahua watershed. The primary drainage is the south fork of Kaukonahua Stream, which discharges to Wahiawa Reservoir (Figure 2-9) (Army HQ 2008b). The inland waters for the majority of SBER are designated Class 2 (OEP 1987c). There are no impaired water bodies in the vicinity of the LZs proposed for use by the squadrons.

SBER terrain is generally ridges and ridge plateaus where storm runoff is locally generated, with sheet flow to nearby gullies eventually discharging to Kaukonahua South Fork Stream and Wahiawa Reservoir. No storm water issues have been identified.

The aquifer for the area is classified as unconfined high level with occurrence in dike compartments (Mink and Lau 1900a). The Schofield Barracks high level water wells are located at the south end of SBER adjacent to Kamehameha Highway. Groundwater occurs approximately at 270 to 275 ft (82 to 84 m) above msl and 500 to 600 ft (152 to 183 m) below ground surface in the Schofield Barracks area (ATSDR 2010).

Dillingham Military Reservation (DMR). The average annual precipitation at DMR ranges from 20 to 30 in (51 to 76 cm) but varies with elevation and time of year. There are several unnamed intermittent streams and no perennial streams on DMR (see Figure 2-9). Streams are incised in steep, narrow valleys containing thin soil cover. Most of the streams carry intermittent flows and are subject to short duration flash floods following rain events (Army HQ 2008b). HDOH classifies these streams as Class 2 and the receiving waters off-shore of DMR are designated Class A marine waters (OEP 1987c). No impaired water bodies are found near the subject LZs.

Groundwater at the airfield area is generally classified as unconfined basal lavas or sedimentary and brackish to fresh towards the Waianae Range upper areas (Mink and Lau 1990a). According to studies done for the Stryker Brigade EIS, DMR is located in the Mokuleia hydrologic unit of the north hydrologic sector. The State of Hawaii Water Commission estimates the sustainable yield of the Mokuleia hydrologic unit to be 12 mgd. The coastal plain is the area where the basal groundwater lens beneath the islands meets the sea and is found at shallow depths. It is also the area where surface water and shallow groundwater in the intermittent drainages discharge to the sea. Due to its proximity to the coast, the basal groundwater is vulnerable to salt water intrusion. In the coastal area, tidal fluctuations and variations in groundwater discharge create a mixing zone in which the groundwater tends to be brackish (Army HQ 2008b).

4.7.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

The average annual precipitation at PTA ranges from 10 to 16 in (25 to 41 cm). PTA lies within the Northwest Mauna Loa and the West Mauna Kea watersheds, including the Keamuku Parcel, which drains to the northern Hualalai and southern Kohala coasts. Temporarily, intermittent stream channels form in the gulches within the Keamuku area during the seasonal rainy period, but quickly dry out after rain events (USAG-HI 2010c). Within the remainder of the site there are no surface streams, lakes, or other bodies of water within PTA boundaries, due to low rainfall, porous soils, and lava substrates. Intermittent stream channels quickly dry after rainfall stops. There are no perennial streams within 15 mi (24 km) of PTA (Army HQ 2008b). Lake Waiau, near the summit of Mauna Kea, located approximately eight miles (13 km) from PTA, is the nearest known surface water body, and there are three fresh water springs in Pohakuloa Gulch on the slope of Mauna Kea. No impaired water bodies are identified in the areas proposed for use by the squadrons.

As indicated in the previous section, soils at PTA are mainly lava flows (pahoehoe and aa), rocky and cinder land. Water erosion on the installation is low due to gentle slopes, low soil erosivity potential, and low intensity/gentle rainfall. Groundwater has not been found at levels less than 1,000 ft (305 m) below ground level. Groundwater occurrence on the Island of Hawaii is not well studied due to the younger age of the island, continuing volcanic activity, and the greater thickness of the volcanic deposits.

4.7.2.4 Pacific Missile Range Facility (PMRF), Island of Kauai

The median rainfall in the area averages approximately 20 in (51 cm). Rainfall runoff generated by the PMRF drainage area consists primarily of overland flow that generally runs off either towards the ocean or to the inland agricultural lands. The amount of runoff generated within the boundaries of PMRF itself is relatively insignificant, as the range has relatively permeable soils, low rainfall, and a relatively small runoff area contribution to the Mana floodplain (CNRH 2004).

There are no perennial streams in the west sector of Kauai, where PMRF is located (see Figure 2-12). Historically, the Mana Plain had nearly 2,000 ac (809 ha) of wetland habitat and was the largest wetland in the Hawaiian Islands. By 1923, the area was drained for sugar cane production, leaving only 200 ac (81 ha) of aquatic habitat comprised mostly of reservoirs and ditches. Surface water on the Mana Plain is limited to drains and agricultural irrigation ponds. Surface water and storm water runoff drains onto former sugarcane lands and agricultural ponds at the base of the Mana cliffs. The runoff is drained through ditches and canals that flow seaward and discharge into the Pacific Ocean through ditches traversing PMRF. Surface water at PMRF is largely concentrated at these drainage ditches. The ADC the Kawaiele and Nohili ditches and is responsible for maintenance of an NPDES permit for the ditch discharges (CNRH 2010). There are no impaired water bodies near areas proposed for aviation operations.

PMRF is located in the Kekaha Aquifer System of the Waimea Aquifer Sector. Kekaha is the driest aquifer system on Kauai. There are two aquifers underlying PMRF, a sedimentary basal, unconfined aquifer with potential use, and a dike-impounded, basal, unconfined aquifer with potential use for drinking water. The sedimentary aquifer is considered irreplaceable and ecologically important with moderate salinity (1,000 to 5,000 mg/l chlorides) and has a high vulnerability for contamination. The dike-impounded aquifer has similar salinity, is considered irreplaceable, and has a low vulnerability to contamination (Mink and Lau 1990a). Beneath PMRF, marine lagoonal deposits are far less extensive than in the inland area. The underlying material is primarily coralline sand, gravel, and rubblestone. Locally, permeabilities can be relatively high. On a macro-scale, however, extensive cementing of the sands results in only moderate overall formation permeability (CNRH 2004).

Receiving ocean waters immediately off-shore of PMRF is designated Class A marine waters with the inland waters surrounding PMRF designated as Class 2 (OEP 1987b).

4.7.2.5 Training Areas on the Islands of Molokai and Maui

Molokai Training Support Facility (MTSF). The average annual precipitation at MTSF is approximately 24 in (61 cm). The area has a mild grade that slopes in the southern direction. The Kaluapeelua Gulch, to the east of MTSF, flows south toward the ocean (see Figure 2-12). Surface water and stormwater either infiltrates into the ground or sheet flows toward the gulch which flows south toward Palaau Homesteads and into the mud flats. There are no perennial streams or impaired water bodies in the area.

MTSF is located in the Manawainui Aquifer System of the Central Aquifer Sector where the aquifer is classified as unconfined basal occurring in flank lavas of the volcanic domes. The maximum basal head in this area is about 5 ft (1.5 m). The groundwater in this area is generally brackish basal water as observed by wells that have been drilled in the area for use in irrigating farm lands. However, this irreplaceable aquifer has potential use for drinking water since it has a low salinity (250-1000 mg/l chlorides), but it also has a high vulnerability for contamination (Mink and Lau 1992).

Kalaupapa Airport. The average annual precipitation at Kalaupapa Airport is approximately 39.4 in (100 cm). Rainfall runoff generated near the airport consists of primarily overland flow that goes into the ocean (see Figure 2-12). The permeable soils, low rainfall, and small area contribute to a relatively insignificant amount of runoff from the area. The off-shore receiving marine waters are designated as Class AA marine waters, to remain in their natural state as nearly as possible with an absolute minimum of pollution.

There are no perennial streams in this northern section of Molokai. No impaired water bodies have been identified. The airport is located in the Kalaupapa Aquifer System of the Northeast Aquifer Sector, which is classified as unconfined basal and not potable (Mink and Lau 1992). Kalaupapa has one of the lowest sustainable yields within this aquifer because the peninsula's groundwater is generally brackish basal water floating on salt water (Stearns and Macdonald

1947). Its close proximity to the ocean makes the basal groundwater vulnerable to salt water intrusion, creating brackish water.

HIARNG Facility. The average annual precipitation at HIARNG is approximately 16 in (41 cm). The area generally slopes 0 to 3 percent in a southwesterly direction. Surface water and storm water runoff sheet flows toward Mokulele Highway and is collected in a roadside swale that eventually diverts from the road via an outlet into Kealia Pond (see Figure 2-13). There are no perennial streams or impaired water bodies near this facility. The closest stream is Waikapu Stream, which is one mile to the west and flows in a southeasterly direction toward Kealia Pond.

The HIARNG Facility is located in the Kahului Aquifer System of the Central Aquifer Sector where the upper aquifer is classified as unconfined high level in perched lava and the lower aquifer is classified as unconfined basal in flank lava (Mink and Lau 1990b). This aquifer is one of the driest on the island, where recharge of the aquifer is contributed to ditch flows from East Maui and streams from West Maui. The groundwater found in this area is generally not potable. The off-shore receiving marine waters are designated as Class A marine waters.

4.7.3 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

Water quality would not be significantly affected. Construction activities would be relatively minor and conducted in compliance with regulatory requirements, e.g., NPDES permit program and RCRA. BMPs would be implemented for erosion and sediment control prior to and during construction, as required (see Sections 2.4 and 3.7), and sustainable design principles would be followed in accordance with applicable laws and executive orders. Therefore, no significant impacts on drainage, hydrology, and water quality would occur with the proposed action, and no mitigation is required.

Under the No Action Alternative, no construction would take place at the training areas and no impacts would occur. No mitigation is required.

Operational Impacts

Under the proposed action, improvements at three training areas would involve increasing impervious areas, as existing landing zones would be enlarged and repaired to accommodate the MV-22. Table 4-31 summarizes the increase in impermeable area and the percent increase relative to the approximate size of each training area. As shown, the increases are 3 percent or less at each training area and most are 0.085 percent or less. These increases would not significantly affect drainage or hydrology during operations.

Table 4-31. Increases in Impermeable Areas in Proposed Training Areas

Area	Facility/LZ	Area from MILCON (SY)	Area Presumed to be Impervious (SY)	Area Presumed to be Impervious (Acres)	Training Area (Acres)	Impervious Area/ Training Area (%)
MCTAB	Gull	1,110	1,110	0.23		
	Hawk	1,110	1,110	0.23		
	Owl	1,110	1,110	0.23		
	Noni	1,110	1,110	0.23		
			4,440	0.92	1,074	0.085%
PTA	Bravo	14,450	14,450	2.99		
			14,450	2.99	131,805	0.001%
MTSF		2,220	2,220	0.46		
			2,220	0.46	14	3.276%

With the proposed action, no change to drainage, hydrology, or water quality would occur. Training activities would continue to adhere to applicable regulatory requirements, as well as operational procedures, to prevent impacts on these resources. No mitigation is required.

With No Action, no changes and no impacts would occur. No mitigation is required.

4.8 BIOLOGICAL RESOURCES

4.8.1 INTRODUCTION

This section addresses biological resources at the Other Training Areas. Subsections used to describe the biological resources in each area are: Terrestrial Flora (focus on Endangered Species Act [ESA]-listed species); Terrestrial Fauna (focus on ESA-listed and Migratory Bird Treaty Act [MBTA]-listed species); Marine Fauna (if applicable; focus on ESA-listed species); Invasive Species; Habitat (Critical Habitat, Jurisdictional Wetlands, and Coral Reefs); and Existing Management Measures. Bird Aircraft Strike Hazard (BASH) and wildland fire risks are both biological resource and safety concerns and therefore are presented in this section and Section 4.10.

The ROI for construction activities at MCTAB, PTA, and MTSF is the construction site itself and adjacent lands and waters that provide habitat for protected species.

The ROI for proposed aviation activities is the area potentially affected by downwash associated with MV-22 aircraft (see Appendix F-2 for details of downwash evaluation). Based on the physical effects of the aircraft downwash, the ROI is defined by a 350-foot (107-meter) radius from the aircraft's landing point. In the case of larger landing zones with more than one landing point, the ROI is the combined areas of overlapping buffers. For purposes of evaluating impacts on protected flora and fauna species, the ROI associated with each LZ, DZ, or airfield is the area created by extending the perimeter of each LZ/DZ/airfield by 350 ft (107 m). See Appendix F-2, which describes downwash effects of the MV-22 aircraft hovering at 20 ft (6 m) AGL.

4.8.2 AFFFECTED ENVIRONMENT

4.8.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

Terrestrial Flora

The majority of vegetation found at MCTAB consists of introduced species. No known ESA-listed plant species have been identified at MCTAB (Drigot, Wilcox, and Druin 2001). Brief descriptions of the LZ areal extent and surface conditions, such as vegetation, are presented in the table in Appendix B-2

Terrestrial and Marine Fauna

Threatened and Endangered Species. Five ESA-listed animal species have been observed at MCTAB, including four endangered resident native waterbirds and the threatened Newell's shearwater (*Puffinus auricularis newelli*) (Table 4-32). The shearwater is known to frequent waters off of MCTAB but does not appear to be common (Drigot, Wilcox, and Druin 2001). The endemic short-eared owl or pueo, a state-listed endangered species, has also been identified at MCTAB.

The waters off of MCTAB are home to three ESA-listed endangered marine animal species, including the endemic Hawaiian monk seal, the migratory humpback whale, and the migratory hawksbill sea turtle. The green sea turtle, an ESA-listed threatened species, frequents Waimanalo Bay (Drigot, Wilcox, and Druin 2001). See (Table 4-32).

Table 4-32. ESA-Listed Animal Species Observed at MCTAB

Scientific Name	Common Name	Hawaiian Name	Regulatory Status
Birds			
Anas wyvilliana	Hawaiian duck	Koloa moali	E
Fulica alai	Hawaiian coot	ʻAlae keʻokeʻo	E
Gallinoula chloropus sandvicensis	Hawaiian gallinule, common moorhen	ʻAlae ʻula	E
Himantopus mexicanus knudseni	Hawaiian stilt	Aeʻo	E
Puffinus auricularis newelli	Newell's/Townsend's shearwater	ʻAʻo	T
Marine Species			
Monachus schauinslandi	Hawaiian monk seal	Ilio holo I ka uaua	E
Physeter catodon	Sperm whale		E
Megaptera novaeangliae	Humpback whale	Kohola	E
Eretmochelys imbriacata	Hawksbill sea turtle	ʻea	E
Chelonia mydas	Green sea turtle	Honu	T

Source: MCBH 2006a: *Appendix C Updated Species Inventory*
E = endangered; T = threatened.

Migratory Birds. Twenty-five species of MBTA-listed migratory birds have been observed at MCTAB. See Table 4-33; those indicated with an asterisk are also ESA-listed species.

Table 4-33. MBTA-Listed Birds at MCTAB

Scientific Name	Common Name	Hawaiian Name	Origin
Waterbirds			
*Anas wyvilliana**	Hawaiian duck	Koloa moali	Endemic
*Bubulcus ibis**	Cattle egret		Introduced
*Fulica alai**	Hawaiian coot	Alae keokeo	Endemic
*Gallinoula chloropus sandvicensis**	Hawaiian gallinule, common moorhen	Alae ula	Endemic
*Himantopus mexicanus knudseni**	Hawaiian stilt	Aeo	Endemic
Nycticorax nycticorax hoactli	Black-crowned night heron	Aukuu	Indigenous

Table 4-33. MBTA-Listed Birds at MCTAB

Scientific Name	Common Name	Hawaiian Name	Origin
Land Birds			
Alauda arvensis	Skylark		Introduced
Asio flammeus sandwichensis	Short-eared owl	Pueo	Endemic
Cardinalis cardinalis	Northern cardinal		Introduced
Carpodacus mexicanus	House finch		Introduced
Mimus polyglottos	Northern mockingbird		Introduced
Tyto alba	Common barn owl		Introduced
Seabirds			
Fregata minor palmerstoni	Great frigatebird	Iwa	Indigenous
Phoebastria immutabilis	Laysan albatross	Moli	Indigenous
Puffinus auricularis newelli	Newell's/Townsend's shearwater	Ao	Indigenous
Puffinus pacificus chlororhunchus	Wedge-tailed shearwater	Uau kani	Indigenous
Sula dactylatra	Masked booby	ʻA	Indigenous
Sula leucogaster	Brown booby	ʻA	Indigenous
Sula sula rubripes	Red footed booby	ʻA	Indigenous
Migratory Birds			
Anas acuta	Northern pintail	Koloa mapu	Migratory
Anas clypeata	Northern shoveler	Koloa moha	Migratory
Arenaria interpres	Ruddy turnstone	Akekeke	Indigenous/Migratory
Calidris alba	Sanderling	Hunakai	Indigenous/Migratory
Heteroscelus incanus	Wandering tattler	Ulili	Indigenous/Migratory
Pluvialis fulva	Pacific golden plover	Kolea	Indigenous/Migratory

Source: MCBH 2006a, *Appendix D: Species of management concern.*

Invasive Species

Invasive plant and animal species are a control concern at MCTAB. Invasive weeds found throughout the installation impair training activities. Fuel buildup by invasive guinea grass increases the threat of wildfire at MCTAB. Poisonous plants such as Christmas berry (*Schinus terebinthifolius*) and castor bean (*Ricinus communis*) pose a potential health hazard to Marines encountering the plants during maneuvers. Invasive mangroves, California grass, and falling logs and debris from ironwood trees create a flood hazard in Inoaole and Waimanalo Streams which flow through the training area. Vegetation encroachment on runways and drop zones impede helicopter training (SWCA 2007).

Habitat

Critical Habitat. MCTAB does not contain any designated critical habitat.

Jurisdictional Wetlands. Two wetlands are located within MCTAB: Puha-Ekahi and Puha Elua along the southern shoreline of Waimanalo Stream. These wetlands are not located in the vicinity of the landing zones proposed for training by the VMM and HMLA squadrons. The wetlands have been identified and mapped as jurisdictional under criteria of the Clean Water Act administered by the U.S. Army Corps of Engineers. These wetlands cover a total of 2.1 ac (0.8 ha) and are classified by various major uses, including waterbird habitat (MCBH 2006a; USACE 2009).

Coral Reefs. The nearshore marine environment is characterized by shallow low-relief coral limestone platforms interspersed with patches of sand. Approximately 48 percent of the inner bay is covered with hard bottom, while 52 percent is covered with sand bottom (NFESC 2002a). The reef zone extends about two miles out from the shoreline. Living coral comprises two percent of the bottom of the inner bay at Waimanalo. Surf induced redistribution of sand and scouring by suspended particles limits colonization and growth of corals and other macro-invertebrates. Ten species of corals have been documented, including species in the genera *Pocillopora, Porites,* and *Montipora* (NFESC 2002a).

Existing Management Measures

Integrated Natural Resources Plan (INRMP). MCTAB is covered by the 2007-2011 Marine Corps Base Hawaii INRMP. The INRMP provides the overall programmatic framework for all natural resource management activities that occur at MCTAB and other MCB Hawaii properties. Among the natural resource management activities at MCTAB that are most pertinent to training by the VMM and HMLA squadrons are various projects to control invasive vegetation that poses flood, erosion, and/or wildland fire risks. Activities include surveying, mapping, and assessing invasive vegetation threats, and designing and implementing projects to control the threats. In addition, there have been ongoing monitoring activities such as the annual fountain grass (*Pennisetum setaceum)* detection and removal surveys. Over the last decade, these surveys have successfully removed incipient outcrops of this highly flammable invasive weed not yet well-established on Oahu.

MCBH Environmental Compliance and Protection Standard Operating Procedures (ECPSOP). The ECPSOP, updated in December 2005, includes natural resources management SOPs. It is intended to orient the MCB Hawaii population on their responsibility to comply with environmental laws. See Section 3.8.2 for more details.

Bird Aircraft Strike Hazard (BASH). BASH risk is managed through compliance with established Marine Corps aviation safety procedures, including air crew SOPs to avoid high-hazard situations and aid in determining if altering or discontinuing operations are required.

Invasive Species. Invasive plants at MCTAB reduce suitable land available for military training and limit training effectiveness and realism and represent a high fire hazard. The Operations and Training Directorate has assigned MCTAB-based staff to regularly control invasive vegetation species along road shoulders, fire breaks, and LZs to reduce fire threat. Standing operating procedures, including education, monitoring, control, and prevention, are in place to manage the transport of invasive species to and from MCTAB (NFESC 2002b).

Wildland Fires. Wildland fire management and response protocols are contained in Base Order 3302.1, All Hazards Force Protection Plan, Appendix 11: Fire Response Management, and incorporated into SOPs for Marine Corps training areas (see Section 3.8.2 for more details). In addition, the 2007–2011 MCBH INRMP includes actions to identify areas of highest wildland fire risk and to replace invasive, fire-prone grasses and replace them with less flammable ground cover (MCBH 2006a).

The MV-22's exhaust deflector system reduces heating of the ground below the aircraft when it is in tiltrotor configuration. This system directs exhaust outward, allowing the aircraft to safely conduct operations at unprepared (unpaved) surfaces. With the deflectors operating, MV-22 exhaust should not heat the ground to a temperature high enough to support combustion of plant material. Additional operational measures, such as avoiding rigid vegetation (bushes, brush) directly beneath the aircraft and limiting time the MV-22 is on deck at unprepared LZs, would further minimize the already remote risk of fire. See Section 3.8.2 and Appendix F-1 for more details.

4.8.2.2 Army Training Areas on the Island of Oahu

The *U.S. Army Garrison Hawaii Integrated Natural Resources Management Plan* (2010-2014) for the Island of Oahu, *Permanent Stationing of the 2/25th Stryker Brigade Combat Team Final EIS* (2008), and *Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transportation of the 2nd Brigade 25th Infantry Division* (USFWS 2003) have been used as sources to describe the affected environment at Army training areas on the Island of Oahu.

USAG-HI provided up-to-date natural resource data in GIS (geographic information system) format for the Army's Oahu training areas. The data identified the location of ESA-listed plants and animals, as well as designated critical habitat, within the subject training areas. According to the data, no ESA-listed species or designated critical habitat were present within the ROI associated with any of the LZs proposed for use in this EIS (see Section 4.8.1 above). Existing USAG-HI data did not provide information on the presence of the ESA-listed Hawaiian hoary bat (*Lasiurus cinereus semotus*) at the Oahu training area LZs.[20] Selected LZs at KLOA and KTA)were surveyed in April 2011 for the presence/absence of the endangered Hawaiian hoary bat, using an acoustic sound recorder (SWCA 2011). The survey report is presented in Appendix F-3.

Terrestrial Flora

Kahuku Training Area (KTA) and Kawailoa Training Area (KLOA). KTA consists mostly of former sugar cane lands now covered in rolling grasslands and shrub lands. An estimated 60 percent of the forest types at KTA are *Casuarina* and *Schinus* forests. KLOA is characterized by deep ravines, dense vegetation, and tropical rainforest. An estimated 98 percent of KLOA is wooded, with higher elevations covered with native *Metrosideros, Acacia, and Dicranopteris* forest. Four native vegetation communities are known at KTA and KLOA: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural.

Four ESA-listed endangered plant species have been identified at KTA. Nineteen ESA-listed endangered plant species have been identified at KLOA. See Table 4-34 (USAG-HI 02010b; USFWS 2003). None of these ESA-listed plant species are found in the vicinity of the LZs proposed for training by the new Marine Corps squadrons.

[20] Since then, surveys conducted by USAG-HI have detected the Hawaiian hoary bat at KTA and KLOA. Publication of the data is pending. (Personal communication, Michelle Mansker, Chief, Natural Resource Section, Environmental Division, Directorate of Public Works, USAG-HI, July 8, 2011)

Table 4-34. ESA-Listed Plant Species at KTA and KLOA

Scientific Name	Common Name	Hawaiian Name	Regulatory Status
KTA			
Cyanea koolauensis	Palolo Valley Rollandia	Haha	E
Eugenia koolauensis	Koolau Eugenia	Nioi	E
Gardenia mannii	Mann's gardenia	Nanu, nau	E
Tetraplasandra gymnocarpa		Oheohe	E
KLOA			
Chamaesyce rockii	Rock's broom spurge	Akoko, koko, kokomalei	E
Cyanea acuminata	Acuminate cyanea	Oha, haha, ohawai	E
Cyanea crispa (Syn. *Rollandia crispa*)	Crimped Rollandia	Oha, haha, ohawai	E
Cyanea humboldtiana (Syn. *Rollandia humboldtiana*)		Haha, ohawai	E
Cyanea koolauensis (Syn. *Rollandia angustifolia*)		Haha, ohawai	E
Cyena st.-johnii (Syn, *Rollandia st.-johnii*)		Oha, haha, ohawai	E
Cyrtandra dentata	Sharp-toothed cyrtandrae	Haiwale kanawao, keokeo	E
Cyrtandra viridiflora	Green-leaved crytandra	Haiwale, kanawao, keokeo	E
Eugenia koolauensis	Koolau Eugenia		E
Gardenia mannii		Nanu	E
Hesperomannia arborescens	Lanai hesperomannia		E
Huperzia nutans (Syn. *Phlegmariurus nutans, Lycopodium nutans*)	Nodding club moss	Wawaeiole	E
Lobelia gaudichaudii spp. *koolauensis*		Oha, haha, ohawai	E
Melicope lydgatei (Syn. *Pelea lydgatei*)	Lydate's pelea	Alani	E
Myrsine juddii	Cloudswept colicwood	Kolea	E

Table 4-34. ESA-Listed Plant Species at KTA and KLOA

Scientific Name	Common Name	Hawaiian Name	Regulatory Status
Phyllostegia hirsuta	Hairy phyllostegia		E
Sanicula purpurea	Purple-flowered sanicle		E
Tetraplasandra gymnocarpa		Oheohe	E
Viola oahuensis	Forbe's Oahu violet		E

E-endangered,; T-threatened
Source: USAG-HI 2010b

Brief descriptions of the areal extent of each LZ and their surface conditions, such as vegetation, are presented in the table in Appendix B-2.

On August 1, 2011, USFWS announced that 20 plants and three insects on the island of Oahu are being considered for protection under the ESA. USFWS will designate critical habitat for 23 plant and insect species, including critical habitat for two plant species already listed as endangered, and will revise critical habitat for 99 plant species currently listed as threatened or endangered. [21]

One candidate plant species has been recorded at KTA: *Pteralyxia macrocarpa* (kaulu). Seven candidate plant species have been recorded at KLOA: *Cyanea calycina* (haha), *Cyanea lanceolata* (haha), *Melicope hiiakae* (Koolau Range melicope, alani), *Platydesma cornuta* var. *cornuta* (pilo kea), *Psychotria hexandra* ssp. *oahuensis* (kopiko), *Pteralyxia macrocarpa* (kaulu), and *Zanthoxylum oahuense* (Oahu prickly-ash, ae) (USAG-HI 2010b).

Schofield Barracks East Range (SBER). SBER has four native vegetative communities: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural. More than half of the wooded area is composed of *Metrodideros, Acacia*, and *Dicranopteris.* Twelve ESA-listed endangered plants species, one threatened plant species, and one candidate species are documented at SBER (see Table 4-35). These are located on the eastern portion of SBER. There is no known ESA-listed plant species near any of the LZs proposed for training (USFWS 2003).

[21] *Federal Register*, August 1, 2011, FWS-R-1-ES-2010-0043.

Table 4-35. ESA-Listed Plant Species at SBER

Scientific Name	Common Name	Hawaiian Name	Regulatory Status
Chamaesyce rockii		Akoko, koko, kokomalei	E
Cyanea acuminata	Honolulu cyanea	Oha, haha, oha wai	E
Cyanea koolauensis (Syn. *Rollandia angustifolia*)	Palolo Valley Rollandia	Haha	E
Cyrtandra subumbellata	Parasol cyrtandra	Haiwale, kanawao, keokeo	E
Cyrtandra viridiflora	Green leaf cyrtandra	Haiwale	E
Gardenia mannii	Mann's gardenia	Nanu, nau	E
Hesperomannia arborescens	Lanai Hesperomannia		E
Huperzia natans (Syn. *Phlegmariurus nutans*)	Nodding club moss	Wawaeiole	E
Isodendrion longifolium	Rock cliff isodendrion	Aupaka	T
Lobelia gaudichaudii ssp. *koolauensis*		Opelu, moowahie	E
Phyllostegia hirsuta	Hairy phyllostegia		E
Pteris lydgatei (Syn. *Pteris lidgatei*)	Lydgate's brake		E
Tetraplasandra gymnocarpa		Ohe ohe	E
Viola oahuensis	Forbe's Oahu violet		E

E-endangered; T-threatened

Source: USAG-HI 2010b.

Two candidate plant species have been recorded in management units near SBER: *Cyanea calycina* (haha) and *Cyanea lanceolata* (haha).

Brief descriptions of the areal extent of each LZ and their surface conditions, such as vegetation, are presented in the table in Appendix B-2.

Dillingham Military Reservation (DMR). Most of DMR is composed of *Leucaena leucocephala/P. maximum* Mixed Grassland and Disturbed Alien Grassland. The only native vegetation community (Lowland Dry Forest and Shrubland) identified at DMR is a small portion of the installation located on slopes along the southern (mauka) boundary. One ESA-listed plant species (*Schiedea kaalae;* maʻoliʻoli) is located here. It is not in proximity to the LZs proposed for use by the squadrons.

Brief descriptions of the areal extent of each LZ and their surface conditions, such as vegetation, are presented in the table in Appendix B-2.

Terrestrial Fauna

Kahuku Training Area (KTA) and Kawailoa Training Area (KLOA). Most of the wildlife species found at KTA and KLOA are nonnative. Until recently, no ESA-listed animal species have been documented at KTA. The endangered Hawaiian hoary bat has been detected at KTA.[22] *Asio flammeus sandwichensis* (pueo, Hawaiian short-eared owl) is believed to be present (USAG-HI 2010b). It is designated as endangered by the State of Hawaii.

Eight ESA-listed endangered animal species have been documented at KLOA (see Table 4-36). They include six endangered terrestrial snail species (*Achatinella spp.)*, the endangered Oahu elepaio (*Chasiempis sandwichensis ibidis*), and the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus,* opeapea). One candidate species for ESA listing has been documented at KLOA: the ocean megalagrion damselfly (*Megalagrion oceanicum*). None of the ESA-listed bird or snail species has been recorded in the vicinity of the LZs proposed for training by the squadrons (USAG-HI 2010b; USFWS 2008). One candidate species recently proposed for ESA-listing by the USFWS has been recorded at KLOA: *Megalagrion oceanicum* (Hawaiian damselfly).

Surveys for Hawaiian hoary bats were conducted in April 2011 at selected LZs at KLOA and SBER with ultrasonic detectors. At KLOA, LZs Black, Elephant's Foot, Nixon, and Red were passively monitored for bat echolocation calls for a period of three nights. See Figure 2-9 in Chapter 2 of this EIS for locations of the surveyed LZs. A map is also shown in Appendix F-3. Each detector began recording at 6:00PM continuously until 6:30AM the following morning. Bat detections are divided into two categories: bat calls and bat passes. A bat call is defined as a single ultrasonic pulse characteristic of a bat, while a bat pass is defined as two or more characteristic ultrasonic pulses separates by less than one second. Recordings of bat calls indicate the probable presence of Hawaiian hoary bats, but these single ultrasonic pulses alone do not confirm the presence of bats since other sources of ultrasonic sounds can occasionally mimic a bat pulse (for example, sounds from insects or birds). A bat pass

[22] Mansker, Michelle, Chief, Natural Resource Section, Environmental Division, Directorate of Public Works USAG-HI. Personal communication. July 8, 2011.

consisting of multiple ultrasonic pulses is used to confirm the presence of the Hawaiian hoary bat at an LZ. The presence of the Hawaiian hoary bat was confirmed at LZ Elephant's Foot at KLOA. No bat calls or bat passes were recorded at LZs Black, Nixon, or Red during the surveys.

Table 4-36. ESA-Listed Animal Species at KTA and KLOA

Scientific Name	Common Name	Hawaiian Name	Regulatory Status
KTA			
Lasiurus cinereus semotus	Hawaiian hoary bat	Opeapea	E
KLOA			
Lasiurus cinereus semotus	Hawaiian hoary bat	Opeapea	E
Chasiempis sandwichensis ibidis	Oahu elepaio	Elepaio	E
Achatinella apexfulva	Oahu tree snail	Pupu kuahiwi, pupu kanioe, kahuli	E
Achatinella bulimoides	Oahu tree snail	Pupu kuahiwi, pupu kanioe, kahuli	E
Achatinella byronii/decipiens	Oahu tree snail	Pupu kuahiwi, pupu kanioe, kahuli	E
Achatinella lila	Oahu tree snail	Pupu kuahiwi, pupu kanioe, kahuli	E
Achatinella livida	Oahu tree snail	Pupu kuahiwi, pupu kanioe, kahuli	E
Achatinella sowerbyana	Oahu tree snail	Pupu kuahiwi, pupu kanioe, kahuli	E

E-endangered; T-threatened
Source: USAG-HI 2010b

Surveys for Hawaiian hoary bats were conducted in April 2011 at selected LZs at KLOA and SBER with ultrasonic detectors. At KLOA, LZs Black, Elephant's Foot, Nixon, and Red were passively monitored for bat echolocation calls for a period of three nights. See Figure 2-9 in Chapter 2 of this EIS for locations of the surveyed LZs. A map is also shown in Appendix F-3. Each detector began recording at 6:00PM continuously until 6:30AM the following morning. Bat detections are divided into two categories: bat calls and bat passes. A bat call is defined as a single ultrasonic pulse characteristic of a bat, while a bat pass is defined as two or more characteristic ultrasonic pulses separates by less than one second. Recordings of bat calls indicate the probable presence of Hawaiian hoary bats, but these single ultrasonic pulses alone do not confirm the presence of bats since other sources of ultrasonic sounds can occasionally mimic a bat pulse (for example, sounds from insects or birds). A bat pass consisting of multiple ultrasonic pulses is used to confirm the presence of the Hawaiian hoary bat at an LZ. The presence of the Hawaiian hoary bat was confirmed at LZ Elephant's Foot at KLOA. No bat calls or bat passes were recorded at LZs Black, Nixon, or Red during the surveys.

MBTA-listed species known to occur at KTA and KLOA include the white-tailed tropicbird (*Phaethon lepturus*), black-crowned night heron (*Nycticorax nycticorax hoactli*), barn owl (*Tyto alba*), great frigatebird (*Fregata minor palmerstoni*), Pacific golden plover (*Pluvialis fulva*), and northern cardinal (*Cardinalis cardinalis*) (Army HQ 2008b).

Schofield Barracks East Range (SBER). No ESA-listed animal species are documented at SBER near the LZs proposed for use by the Marine Corps squadrons. One endangered terrestrial snail *(Achatinella byronii/decipiens*) is currently documented as present at the eastern portion of SBER (USAG-HI 2010b; USFWS 2003). Native birds recorded in other parts of SBER include the Oahu elepaio, Oahu creeper, iiwi, Oahu amakihi, apapane, Oahu akepa (*Loxops coccineus wolstenholmii*), white-tailed tropic bird, black-crowned night heron, and Pacific golden-plover (Army HQ 2008b).

During the April 2011 survey described above, a bat call was detected at LZ Ku Tree at SBER, indicating the probable though unconfirmed presence of the Hawaiian hoary bat in that area. No bat calls or passes were detected at LZ Italy.

The following MBTA-listed species are known to occur at Schofield Barracks Main Post, including SBER: white-tailed tropicbird (*Phaethon lepturus*), black-crowned night heron (*Nycticorax nycticorax hoactli*), barn owl (*Tyto alba*), Pacific golden plover (*Pluvialis fulva*), and northern cardinal (*Cardinalis cardinalis*) (Army HQ 2008b).

Dillingham Military Reservation. Three ESA-listed endangered water birds—the Hawaiian duck (*Anas wyvilliana*), Hawaiian coot (*Fulica alai*), and Hawaiian moorhen (*Gallinula chloropus sandvicensis*)—have been documented at DMR, using the area when standing water is present.[23]

The following MBTA-listed species are known to occur at DMR: white-tailed tropicbird (*Phaethon lepturus*), black-crowned night heron (*Nycticorax nycticorax hoactli*), barn owl (*Tyto alba*), Pacific golden plover (*Pluvialis fulva*), and northern cardinal (*Cardinalis cardinalis*) (USAG-HI 2010b; Army Sec 2004).

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[23] Mansker, Michele. Personal communication. July 8, 2011.

Invasive Species

Much of the low-lying areas of DMR, KTA, KLOA, and SBER consist of nonnative vegetation; some of the species are invasive and pose a serious threat to the native ecosystems found in more remote locations of the training areas. At least six invasive/weed species have been located at DMR, 19 at KTA, 26 at KLOA, and six at SBER. When these species are determined to have negative effects on training areas and native plant habitats and ecosystems, they are controlled. Invasive species found at the training areas include guinea grass (*Panicum maximum*), Christmas berry, strawberry guava, and iron wood.

In 2011, the Oahu Army Natural Resources Program found a highly invasive weed at KTA. *Chromolaena odorata* is on the State of Hawaii noxious weed list. This is the first time it has been seen in the state. The weed is easily transported by boots, gear, and vehicles, and seeds are also wind-dispersed. At KTA it has been observed spreading along trails and roads. (Note: None of the LZs proposed for use by the new squadrons are in the KTA infestation area.)

Habitat

Critical Habitat

Kahuku Training Area (KTA) and Kawailoa Training Area (KLOA). The Pupukea-Paumalu Forest Reserve in the western portion of KTA is designated as plant critical habitat. Critical habitat for the Oahu elepaio (*Chasiempis sandwichensis ibidis*) is located in the southern portion of KLOA (USAG-HI 2010b). Neither critical habitat is in the vicinity of LZs proposed for training by the new Marine Corps squadrons.

Schofield Barracks East Range (SBER). Oahu elepaio (*Chasiempis sandwichensis ibidis*) is the only ESA-listed bird species documented at SBER with designated critical habitat. An area of 2,226 ac (901 ha) in the eastern portion of SBER is designated as critical habitat (USAG-HI 2010b). None of the LZs proposed for training at SBER is located within the elepaio critical habitat.

Dillingham Military Reservation. There is no designated critical habitat at DMR. Plant critical habitat lies on the slope outside the southern boundary of the installation (USAG-HI 2010b).

Jurisdictional Wetlands

Kahuku Training Area (KTA) and Kawailoa Training Area (KLOA). The U.S. Army Corps of Engineers (USACE) identified Onion Pond as a regulated wetland at KTA. Onion Pond is located on the south side of KTA, near Drum Road. It is not in proximity to any of the LZs proposed for training.

KLOA has three areas likely to contain wetlands; however, because of steep terrain and dense vegetation, field verification for the presence of wetlands has not been performed. The three areas are Peahinaia Pond, Lehua Makanoe Bog, and Poamoho Pond. Lehua Makanoe Bog is located along the summit of the Koolau Mountains and contains bog-specific plant species, other Hawaiian species, and a number of rare and endangered plant species. The Army has fenced the area to protect it. Peahinaia Ponds are located on the south ridge of Opaeula Gulch, near the center of KLOA. Poamoho Pond is located along the KLOA boundary near the top of the Koolau Mountain Range and south of Lehua Makanoe Bog.[24] None of these possible wetlands is in the vicinity of LZs proposed for training by the squadrons.

Schofield Barracks East Range (SBER). USACE completed a wetlands delineation survey of SBER; three were determined to be regulated wetlands (Koolau Reservoir, Sedge Pond, and Bowl Wetland) (USAG-HI 2010b). The LZs proposed for training are not in the vicinity of these wetlands.

Dillingham Military Reservation (DMR). USACE completed a wetlands delineation survey of DMR. A perched wetland located on the isolated slopes of the southern boundary of the installation was the only area determined to be a regulated wetland (USAG-HI 2010b). It is not in the vicinity of LZs proposed for training by the squadrons.

Coral Reefs

Coral reefs are found in the coastal waters off of DMR within 0.5 mi (0.8 km) of the shoreline which may provide habitat for marine life (Army HQ 2008b; USAG-HI 2010b). DMR is not located on the shoreline.

Existing Management Measures

Integrated Natural Resources Management Plan (INRMP). USAG-HI's INRMP, 2010-2014 (July 2010) describes how USAG-HI will comply with laws associates with the ESA, MBTA, and other applicable laws in its use of lands for training on the island of Oahu. Several installation-specific documents drive many of the natural resource program goals and projects noted in this INRMP, including two that apply to training areas covered in this EIS:

- *Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Military Installations, Island of Oahu* (USAG-HI 2003)

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[24] U.S. Army Corps of Engineers, Honolulu District. September 2005. Oahu Wetlands of USARHAW.

- *Implementation Plan for Oahu Training Areas: Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, and Kahuku Training Area* (USAG-HI 2008a).

The following program elements of the USAG-HI INRMP (USAG-HI 2010b) are relevant to the proposed Marine Corps aviation training activities:

- Threatened and endangered species management. Execute programs/projects that work towards the stabilization of listed species that may be adversely affected by military training activities. Implement regulations that address training restrictions due to the presence of threatened and endangered species. Current management measures applicable to the proposed action include the control of non-native plant species biomass to reduce fire threat and prevent the spread of weeds into native habitat.
- Migratory bird management. Ensure the Army meets the requirements of the MBTA. Document and report birds "taken" as a result of military readiness activities. The Army recognizes that migratory birds can contribute to BASH at Army airfields but does not consider current Army training at the Oahu training areas as significantly impacting migratory birds.
- Pest management. Remove/minimize the impact of pest animal and plant species. Control invasive species within and adjacent to landing zones. Develop and implement an educational program regarding cleaning vehicles and field gear to all troops using Oahu installations. For more details on current USAG-HI initiatives, see the Invasive Species section below.
- BASH. Reduce bird/air strike hazards to the lowest possible level. Actively support the BASH program to protect aircrew lives and prevent serious damage to or destruction of military aircraft. Continue efforts to control birds. Continue to work with USDA Wildlife Services on bird control. For more details on USAG-HI's BASH program, see the BASH section below.
- Wildland fire management. Support wildland fire initiatives to minimize future fires. Reduce fuels where possible to protect federally listed and rare species. Develop environmental awareness materials for those using the training areas. For more details on USAG-HI's current wildland fire management actions, see the Wildland Fires section below.

Bird Aircraft Strike Hazard (BASH). USAG-HI currently implements a BASH prevention program at its airfields, including DMR. Bird control efforts have been in place at USAG-HI airfields since 1988. The Army's plan is based on guidance from USDA Wildlife Services. The principal control methods are trapping and hazing. BASH activities are recorded daily and reported on a quarterly basis (USAG-HI 2010b). In addition, at landing zones not located at the airfields, BASH risk is managed through air crew compliance with established Marine Corps aviation safety procedures, including avoiding high-hazard situations and determining if altering or discontinuing operations are required.

Invasive Species. EO 13112 requires all federal agencies to prevent the introduction of invasive species, provide control, and minimize the economic, ecologic, and human health impacts that invasive species may cause. In compliance with its INRMP, USAG-HI spends considerable effort annually in controlling non-native weed species around rare plants, along fuel breaks, fences and roads, and in military training areas. Invasive plant species control focuses on six principal areas (USAG-HI 2010b):

- Preventing weed spread through education and implementation of prevention measures learned;
- Surveying to detect new weeds before they become established;
- Prioritizing weed control areas and projects;
- Monitoring implementation plans;
- Research; and
- Landscaping guidelines.

With the 2011 observation of the highly invasive *Chromolaena odorata* at KTA, the Army Natural Resources Program is considering restriction of training in the *Chromolaena odorata*-infested portion of KTA. Other management measures would include educating soldiers and range staff about the weed, adding information about the weed to the Environmental Compliance Officer training for Army units, and encouraging soldiers to wash vehicles.[25]

Wildland Fires. USAG-HI has implemented an Integrated Wildland Fire Management Plan as a comprehensive approach to reduce the frequency of wildfires, impacts of training-related fires, and associated costs and damages. The plan, which covers the Army's Oahu and Pohakuloa training areas, complies with all applicable laws, regulations, and USFWS biological opinions. It also fulfills requirements of the Army Wildland Fire Policy Guidance of September 2002. Within the Integrated Wildland Fire Management Plan are the SOPs for the Oahu sub-installations. Many of these procedures focus on the protection of ESA-listed

[25] Personal communication, email from Jane Beachy, Ecosystem Restoration Program Manager, Oahu Army Natural Resources Program, April 28, 2011, to Dr. Diane Drigot, Environmental Department, MCB Hawaii Kaneohe Bay.

species and their habitats. Each Oahu sub-installation has specific Fire Danger Rating System restrictions that those using the training areas must be aware of and adhere to. Fire breaks and fuel management are part of the fire control system. Fuel management includes prescribed burning and mechanical, hand, and chemical treatments (USAG-HI 2010b).

4.8.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

USAG-HI natural resource surveys and GIS data, including efforts conducted to support the 2004 Stryker Brigade Combat Team EIS, have identified ESA-listed species and locations, as well as critical habitat, at PTA. Natural resource surveys were conducted in April and May of 2011 at PTA in support of this EIS to supplement the USAG-HI data. The surveys focused on ESA-listed plant and animal species and MBTA-listed species at 18 LZs proposed for use by the new squadrons. Federally protected plant and animal species had been documented during earlier surveys at these particular LZs. Avian and botanical species surveys were carried out on April 6–12, 2011, covering each LZ plus a 350-foot (107-meter) buffer area around the LZ. The surveyed area accounts for MV-22 rotor wash during hovering, landing, and take-offs. Surveys for Hawaiian hoary bats were conducted at each of the 18 LZs between May 3–19, 2011. See Appendix F-3 for a copy of the natural resource survey report (SWCA 2011). Methodologies used to conduct the surveys are described in this report. The report also shows a map of each LZ and the surveyed area.

USAG-HI has conducted numerous fauna and flora surveys and has monitored for the presence of ESA-listed species at PTA. The following sources have been used in this section to characterize the natural environmental at PTA: *Integrated Natural Resources Management Plan, 2010-2014, Island of Hawaii, Pohakuloa* (July 2010); *Permanent Stationing of the 2/25th Stryker Brigade Combat Team Final EIS* (2008); *Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Army Installations, Island of Hawaii* (USFWS 2003); and *Reinitiation of Formal Section 7 Consultation for Additional Species and New Training Actions at Pohakuloa Training Area, Hawaii* (December 12, 2008).

Terrestrial Flora

Thirty-three distinct plant communities have been described at PTA. Ground cover ranges from little to no plant cover (barren lava) to species-rich kipuka (vegetated area found in the midst of lava). Fifteen endemic plant species at PTA are listed as endangered and one is listed as threatened (see Table 1 in Appendix F-3), and two are candidate endangered species (USAG-HI 2010c).

The 18 surveyed LZs support ruderal vegetation and/or bare ground with remnant patches of native vegetation. Most of the native habitat observed in and around the LZs has been disturbed by military operations or ongoing ungulate browsing. These disturbances have greatly reduced the potential of these areas to support plant and wildlife species. Furthermore, PTA has been under severe drought conditions for several years, leaving much of the vegetation (and potential habitat) either dead or severely stressed.

Two creeping mint (*Stenogyne angustifolia*) plants were observed in the buffer area surrounding LZ X-ray (approximately 300 ft [91 m] from the edge of the LZ). Located within 3.3 ft (1 m) from each other, these individuals were mapped with one point. Creeping mint is listed as endangered.

Brief descriptions of the areal extent of each LZ and their surface conditions, such as vegetation, are presented in the table in Appendix B-2.

Terrestrial Fauna

Thirty-seven avian species have been recorded at PTA; four of these species have not been recorded at the installation for more than 15 years. Of the remaining 33 species recorded in recent years, five are ESA-listed species (endangered), and another eight are protected under the MBTA. See a complete list in Appendix F-3,

During the April 2011 survey, 22 avian species were observed. The only ESA-listed species encountered was a pair of nene (*Branta sandvicensis,* Hawaiian goose), heard calling approximately 1,500 ft (457 m) from LZ Boogie, beyond the survey boundary. Monitoring of nene has been conducted at PTA's Training Range 1 (impact area) since early 2009, documenting seasonal use patterns and on-site behavior. Arrival and departure vectors for nene to and from Range 1 are known to cross over or near LZ Boogie. LZ Boogie is not proposed for use by the VMM and HMLA squadrons.

MBTA-listed species observed during the April 2011 survey included apapane (*Himatione sanguine)*, Hawaii amakihi (*Hemignathus virens*), house finch (*Carpodacus mexicanus*), northern cardinal (*Cardinalis cardinalis*), northern mockingbird (*Mimum polyglottus*), skylark (*Alauda arvensis*), and Pacific golden plover (*Pluvialis fulva*). MBTA-listed species were recorded at each of the 18 LZs.

The ESA-listed endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) is known to occur at PTA. Surveys for the Hawaiian hoary bat have been conducted at the installation, including monthly monitoring between February 1992–January 1993 (Jacobs 1993, Menard 2001), surveys at Bradshaw Army Airfield during May-October 1992 (Jacobs, 1993, 1994), and a radar survey in June–July 1995 at 19 sampling sites (Cooper et al, 1996). A survey using echolocation to detect bats was started in 2007. Based on limited available information, Hawaiian hoary bats are present in low numbers throughout PTA year-round. Bat activity is apparently greatest from September to December (post-lactation period), least from January to March (pre-pregnancy period), with a minor peak in May and June during the breeding season. The year-round presence of bats and availability of suitable roosting habitat indicate that bats are likely breeding, foraging, and possibly roosting at PTA, although limited survey data cannot confirm whether bats roost there. Based on observation of long-distance flights, Jacobs (1993, 1994) concluded that bats likely commuted to forage at PTA from roosting areas outside the installation (USFWS 2003).

During the 2011 survey at PTA conducted in support of this EIS, the presence of Hawaiian hoary bats was confirmed at 12 of the 18 surveyed LZs. Bat calls were detected at LZs Emu, Noble, and Tango, but no bat passes were recorded at these three LZs. Three other LZs (LZs Rob, Turkey and X-ray) did not have detections of either bat calls or bat passes. Based on the proximity of the LZs to one another, it can be generally inferred that bats frequent the entire area. Although there was a surprisingly high level of bat activity at DZ Mikilua, the short sampling period (minimum of three nights) tends to artificially magnify bat activity values. Appendix F-3 shows a map of bat activity observed at PTA during the study period.

Invasive Species

PTA has identified invasive species within the boundaries of the installation. The natural resources staff is involved in the control of invasive and noxious weeds, including fountain grass *(Pennisetum setaceum),* fireweed (*Senecio madagascarensis*), banana poka (*Passiflora mollissima*), and Russian thistle (*Salsola kali*). Fountain grass and fireweed are ranked highest in need of control (USAG-HI 2010c; Army HQ 2008b).

Habitat

Critical Habitat. Two areas at PTA in the Saddle Road vicinity are designated as palila *(Loxioides bailleui)* critical habitat. None of the LZs proposed for use by the new squadrons are within the palila critical habitat. The critical habitat is composed of mamane (*Sophora chrysophylla*) and naio (*Myoporum sandwicense*) forests which play an essential role in the survival of this endangered species. No documented populations of palila occur in critical habitat on the installation, but there could be incidental usage, as these birds are found on adjacent state lands (USAG-HI 2010c; Army HQ 2008b).

Jurisdictional Wetlands. No wetlands have been identified at PTA (Army HQ 2008b).

Coral Reefs. This is not applicable; PTA is not in a coastal location.

Existing Management Measures

This section summarizes existing measures implemented by PTA to address issues relating to biological resources.

Integrated Natural Resources Management Plan. PTA implements ongoing control, management, and monitoring programs to safeguard protected species and other natural resources at the base. In compliance with the Sikes Act Improvement Act, as amended through 2003 (P.L. 108-136), USAG-HI's guidance document for implementation of natural resource management programs at PTA is the *Integrated Natural Resources Management Plan, 2010-2014, Pohakuloa, Island of Hawaii*. Three installation-specific documents drive many of the INRMP program goals and projects:

- *Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Military Installations, Island of Hawaii* (USFWS 2003).
- *Reinitiation of Formal Section 7 Consultation for Additional Species and New Training Actions at Pohakuloa Training Area, Hawaii* (12 December 2008).
- *Draft Pohakuloa Implementation Plan* (USAG-HI 2010).

The following program elements in the INRMP (Army HQ 2008b) are applicable to the proposed Marine Corps aviation training activities:

- Threatened and endangered species management. The USFWS 2003 Biological Opinion tasked the Army to develop and execute an Implementation Plan for the management of specific ESA-listed species. The plan was further developed to include all new conservation measures identified in the USFWS 2008 Biological Opinion. Topics covered in the Implementation Plan include, among other items, monitoring and outplanting of listed plants; endangered bird surveys; Hawaiian hoary bat monitoring, conservation, and management; and invasive plant species control. Wildland fire management is a requirement of the 2003 Biological Opinion; natural resources staff has been tasked with improving firebreaks at PTA.
- Migratory bird management. USAG-HI has identified measures to minimize and mitigate adverse impacts of authorized military readiness activities on MBTA-listed species, including protocols to monitor impacts of such activities on migratory birds.

- Pest management. USAG-HI's invasive species program is designed to detect and manage invasive species and to inhibit negative impacts to federally listed species, the environment, and military training operations. See the Invasive Species section below for details about PTA's program.
- BASH. The INRMP goal is to reduce bird aircraft strike hazards to the lowest possible level. Objectives include documenting all bird/bat strikes and managing wildlife and the area surrounding Bradshaw Army Airfield to prevent strike hazards. See the BASH section below for information about current management activities at PTA.
- Wildland fire management. The INRMP goal is to support wildland fire initiatives to minimize future fires. Objectives pertaining to PTA include reducing non-native fuels where possible and developing environmental awareness materials. Current management activities are being carried out in compliance with the Integrated Wildland Fire Management Plan for U.S. Army lands in Hawaii. See the Wildland Fires section below for more information.

Pohakuloa External Standard Operating Procedures. These SOPs provide information and establish procedures for the planning of training operations and use of PTA (USAG-HI, 2009). Restrictions contained in the SOPs relevant to natural resources protection include confining vehicular travel to established roads (no cross-country driving), restricting vehicular access within fence units established to protect endangered plants or animals (prior permission required), and prohibiting open fires and smoking (USAG-HI 2010c).

Bird Aircraft Strike Hazard (BASH). According to the INRMP, bird strikes are possible at PTA, but none have been documented. USAG-HI implements a BASH prevention program at Bradshaw Army Airfield and contracts USDA Wildlife Services for BASH control. The program is part of the USAG-HI Integrated Pest Management Plan. Nuisance wildlife are typically controlled by trapping and hazing.

Invasive Species. Invasive species management measures are identified in the installation's INRMP. The 2003 USFWS Biological Opinion requires the Army to implement a non-native plant monitoring program to control invasive species in and adjacent to landing zones and trails, around federally listed species, and along roadsides (USAG-HI 2010c; Army HQ 2008b). To address invasive species management issues outside the installation, Army natural resources staff has development an invasive plant management and control section as part of the Pohakuloa Implementation Plan referenced above.

Non-native species have been ranked, based on invasiveness, extent, ability to outcompete native species, amount of fire fuel created, and ability to be contained. Two species, fountain grass *(Pennisetum setaceum*) and fireweed (*Senecio madagascariensis*), are ranked highest in need of control. Specific controls for each high priority species are outlined in the Pohakuloa Implementation Plan referenced above.

PTA has an Invasive Species Invertebrate Monitoring and Control Protocol designed to document locations of invasive invertebrate such as the Argentine ant *(Linepithema humile)*, a proven threat to native faunal species, and yellow jackets *(Vespula pensylvanica*). This protocol is intended to check locations that could provide access to the installation (e.g., Kawaihae Harbor), identify new locations, and eradicate new introductions to prevent extensive spread of these invasive species.

Wildland Fires. An Integrated Wildland Fire Management Plan was completed by the 25th ID and U.S. Army, Hawaii in October 2003, and a programmatic environmental assessment for implementation of the plan was completed in June 2006. The plan, currently being updated, specifies methods for controlling fire frequency, intensity, and size on Army lands, relying on fire prevention, pre-suppression, and suppression. Fire access roads and fuel management corridors are part of the fire control system at PTA. Standing operating procedures (SOPs) for PTA are included in the Integrated Wildland Fire Management Plan. Many of these SOPs focus on protection of federally listed protected species and their habitats (USAG-HI 2010c).

4.8.2.4 Pacific Missile Range Facility (PMRF), Island of Kauai

The *PMRF Integrated Natural Resources Management Plan* (CNRH 2010) and the *Hawaii Range Complex Final EIS/OEIS* (2008) (Navy 2008a) have been used to describe the affected environment in the proposed action's region of influence at PMRF.

The Mana Plain, the region containing PMRF, is historically associated with extensive wetlands separated from the coastal beach by high sand dunes. The four significant ecosystems in the PMRF area are (1) altered and natural wetlands, (2) coastal beach, (3) high dune, and (4) marine, near shore.

Terrestrial Flora

Six vegetation types are recognized on the undeveloped portions of PMRF: kiawe-koa haole scrub, aalii-nama scrub, pohinahina, naupaka dune, strand, drainage-way wetlands. Kiawe-koa haole scrub, landscaped areas, and weedy fields (ruderal vegetation) dominate PMRF's airfield area. Ruderal vegetation is found alongside paved and unpaved roads and on disturbed parcels. Well-developed strand vegetation occurs as a narrow band along the coastline.

There are no occurrences of plants currently listed or pending listing as threatened or endangered species under the ESA at PMRF. However, there is unoccupied USFWS-designated critical habitat for the lauehu *(Panicum niihauense)* within the range. Vegetation types at PMRF and critical habitat locations are illustrated in Figure 4-4 and Figure 4-5. Portions of the critical habitat are located along the shoreline fronting the airfield.

Brief descriptions of the areal extent of each LZ and their surface conditions, such as vegetation, are presented in the table in Appendix B-2.

Terrestrial and Marine Fauna

ESA-Listed Threatened and Endangered Species. ESA-listed threatened and endangered faunal species at PMRF are listed in Table 4-37.

Table 4-37. ESA-Listed Threatened and Endangered Faunal Species at PMRF

Scientific Name	Common Name/ Regulatory Status[2]	Comments[1]
Anas wyvilliana	Hawaiian duck (Koloa) [E]	The Hawaiian duck has been observed in drainage ditches and ponds on the base.
Gallinula chloropus sandviciensis	Hawaiian common moorhen [E]	The moorhen has been observed in drainage ditches and ponds on the base. It nests on Kauai year-round.
Fulica alai	Hawaiian coot [E]	The Hawaiian coot has been observed in drainage ditches and ponds on the base. It nests on Kauai year-round.
Himantopus mexicanus knudseni	Hawaiian stilt [E]	The Hawaiian stilt has been observed in drainage ditches and ponds on the base. It nests on Kauai year-round.
Branta sandvicensis	Hawaiian goose (Nene) [E}	An active nene nest was found at PMRF in November 2009, less than a mile from the south end of the active runway. Other adult nene (~20) were also observed in this area. USDA Wildlife Services works with the Navy to haze nene from the runway area and to relocate nesting nene and goslings to decrease bird air strike hazard.
Puffinus auricularis newelli	Newell's shearwater [T]	This bird nests from April to November in the interior mountains of Kauai. Fledglings leave their nests at night in October and November and head for open ocean. They may become temporarily blinded by lights when flying near developed areas, and collide with trees and structures.
Phoebastria albatrus	Short-tailed albatross [E]	
Pterodroma phaeopygia sandwichensis	Hawaiian dark-rumped petrel [E]	The Hawaiian dark-rumped petrel arrives in February and may traverse PMRF from its nesting grounds to the sea.
Lasiurus cinereus	Hawaiian hoary bat [E]	Hawaiian hoary bats have been observed foraging around the sewage treatment ponds, just offshore of the northern PMRF main base, and at Polihale State Park north of the base.

Table 4-37. ESA-Listed Threatened and Endangered Faunal Species at PMRF

Scientific Name	Common Name/ Regulatory Status[2]	Comments[1]
Monachus schauinslandi	Hawaiian monk seal [E]	Monk seals regularly haul out on the PMRF main base beach. Monk seal births occurred on the beach in 1999, 2003, and 2004.
Megaptera novaeangliae	Humpback whale [E]	Hampback whales have been observed offshore waters during the winter season.
Chelonia mydas	Green sea turtle [T]	Green sea turtles are regularly observed basking on-shore in the vicinity of Nohili Ditch. The turtles have not nested anywhere along the beach in the last 14 years.
Eretmochelys imbricate	Hawksbill turtle [E]	

E-endangered; T-threatened; C-candidate
Source: CNRH 2010.
1 Source: PMRF 2010.
2 All federally-listed species under ESA are also State of Hawaii-listed species.

Migratory Birds. Fourteen MBTA-listed seabird and shorebird species have been observed at PMRF during some portion of the year (see Table 4-38).

Table 4-38. MBTA-Listed Bird Species Observed at PMRF

Scientific Name	Hawaiian Name	Common Name	Comments
Phoebastria Immutabilis	Moli	Laysan albatross	The Laysan albatross is a native seabird species, with more than 90% of the world population nesting in the Hawaiian archipelago. This species attempts to nest next to the runway and in the KTF area of PMRF, and birds are relocated from these areas to prevent BASH.
Phoebastria nigripes	Not available	Black-footed albatross	The black-footed albatross is a State of Hawaii-listed threatened as well as a MBTA-protected native seabird. Black-footed albatrosses have been observed loafing near the runway at PMRF; however, there has been no record of breeding at the installation. In 2009, the USFWS reopened the public information solicitation period on an October 9, 2007, 90-day finding on a petition to list the black-footed albatross as threatened or endangered under the ESA. The petition is still under review.

Table 4-38. MBTA-Listed Bird Species Observed at PMRF

Scientific Name	Hawaiian Name	Common Name	Comments
Sula leucogaster	‘A	Brown booby	The brown booby is a native seabird that has been observed foraging off shore at PMRF. It most often forages in large, mixed species flocks associated with schools of large predatory fishes that drive prey species to the surface. No nesting has occurred on PMRF.
Puffinus pacificus	Uaukani	Wedge-tailed shearwater	Wedge-tailed shearwaters are native pelagic seabirds. There are two breeding colonies located at PMRF, one near the beach cottages and one in the Nohili dunes area. Wedge-tailed shearwaters breed from February through November. They are ground-nesting birds.
Nycticorax nycticorax	Aukuu	Black-crowned night heron	The black-crowned night heron is a native, medium-sized heron. The species has been observed in the ditches and oxidation ponds at PMRF.
Bubulcus ibis	Not available	Cattle egret	The cattle egret is a small, white egret often found in pastures and roadsides. Cattle egrets are found on all grassy areas on PMRF. These birds pose a bird air strike hazard.
Pluvialis fulva	Kolea	Pacific golden plover	Pacific golden plovers are commonly observed at PMRF between the months of August and April. These birds prefer well-tended grounds, such as lawns and other grassy areas, which allow them to find food more easily and also to be on the look-out for predators.
Pluvialis squatarola	Not available	Black-bellied plover	The black-bellied plover is a large shorebird of coastal beaches. The species has been observed at the beach at PMRF. On its wintering grounds, it roosts in dense flocks but spreads out over sandy and muddy flats to forage as the tide recedes. Although generally a coastal bird, it also forages successfully in freshwater and upland habitats (Cornell Lab of Ornithology 2008).
Heteroscelus incanus	Ulili	Wandering tattler	The wandering tattler winters in the Hawaiian Islands. Adults arrive from July to August and juveniles from September to November. They have been observed at the beach at PMRF.
Arenaria interpres	Not available	Ruddy turnstone	The ruddy turnstone is a small, calico-colored shorebird that winters on the shorelines of the main Hawaiian Islands. While in Hawaii, they are almost exclusively coastal, foraging mostly along stony or rocky shorelines with abundant seaweed and commonly on sandy shorelines and in mudflats and river deltas. They have been observed at the beach at PMRF.

1 Source: CNRH 2010, Table 3-3.

Figure 4-4 and Figure 4-5 show the locations of certain ESA- and MBTA-listed faunal species at PMRF. Figure 4-6 shows reported locations of the endangered Hawaiian monk seal.

Invasive Species

Invasive species have been identified at PMRF. Predators such as rats pose a threat to native species on the installation. Kiawe-koa haole scrub (*Prosopis pallid*a and *Leucaena leucocephala*) occupies roughly 400 ac (160 ha) of the main base at Barking Sands. Lantana (*Lantana camara*) is found in the Kiawe-koa haole scrub areas. The long-thorned kiawe or *Prosopis julifora*, present along part of the PMRF coastline, has been deemed a hazard at the base (CNRH 2010).

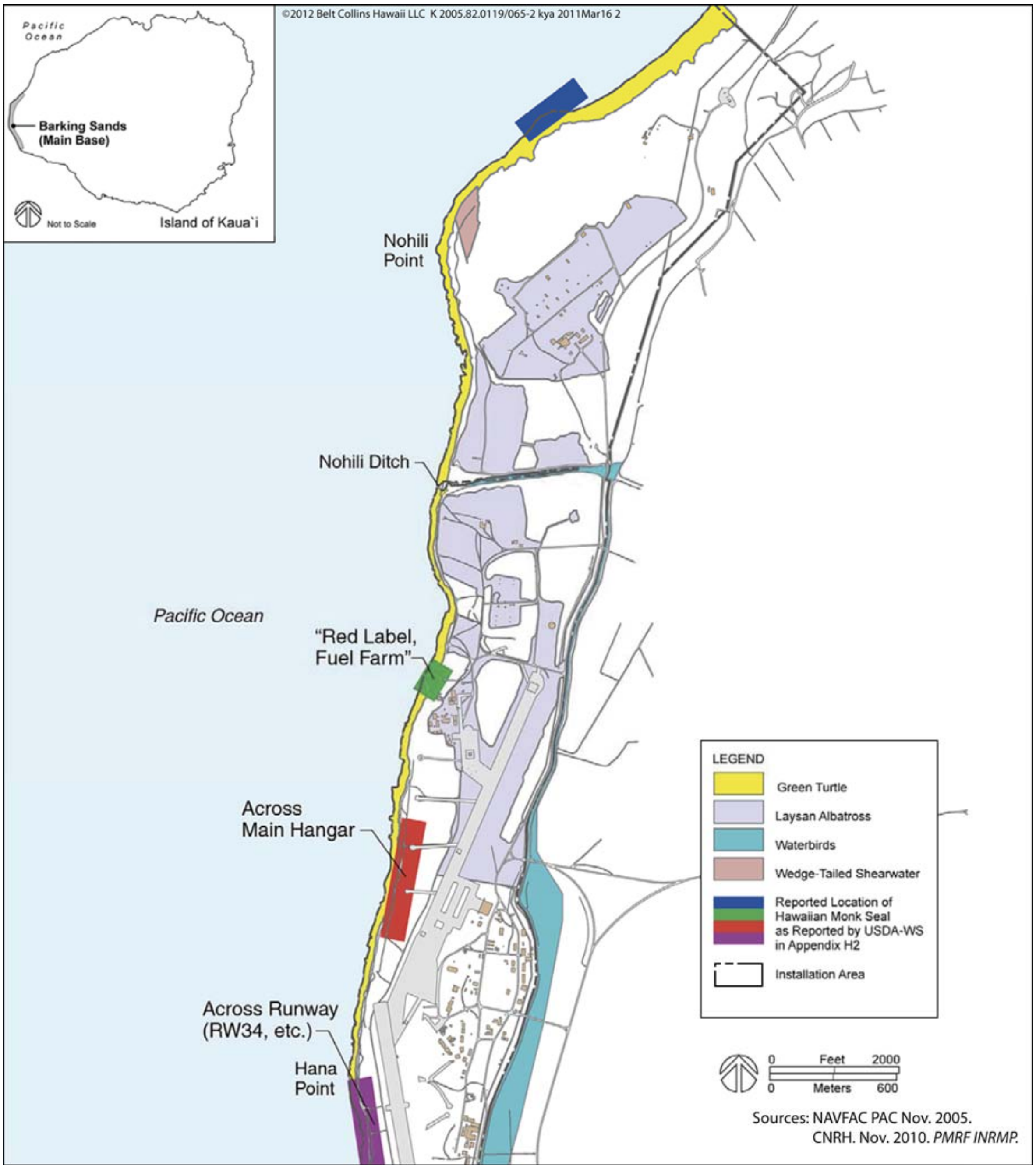


Figure 4-4. Selected Listed Faunal Species, PMRF Northern Area

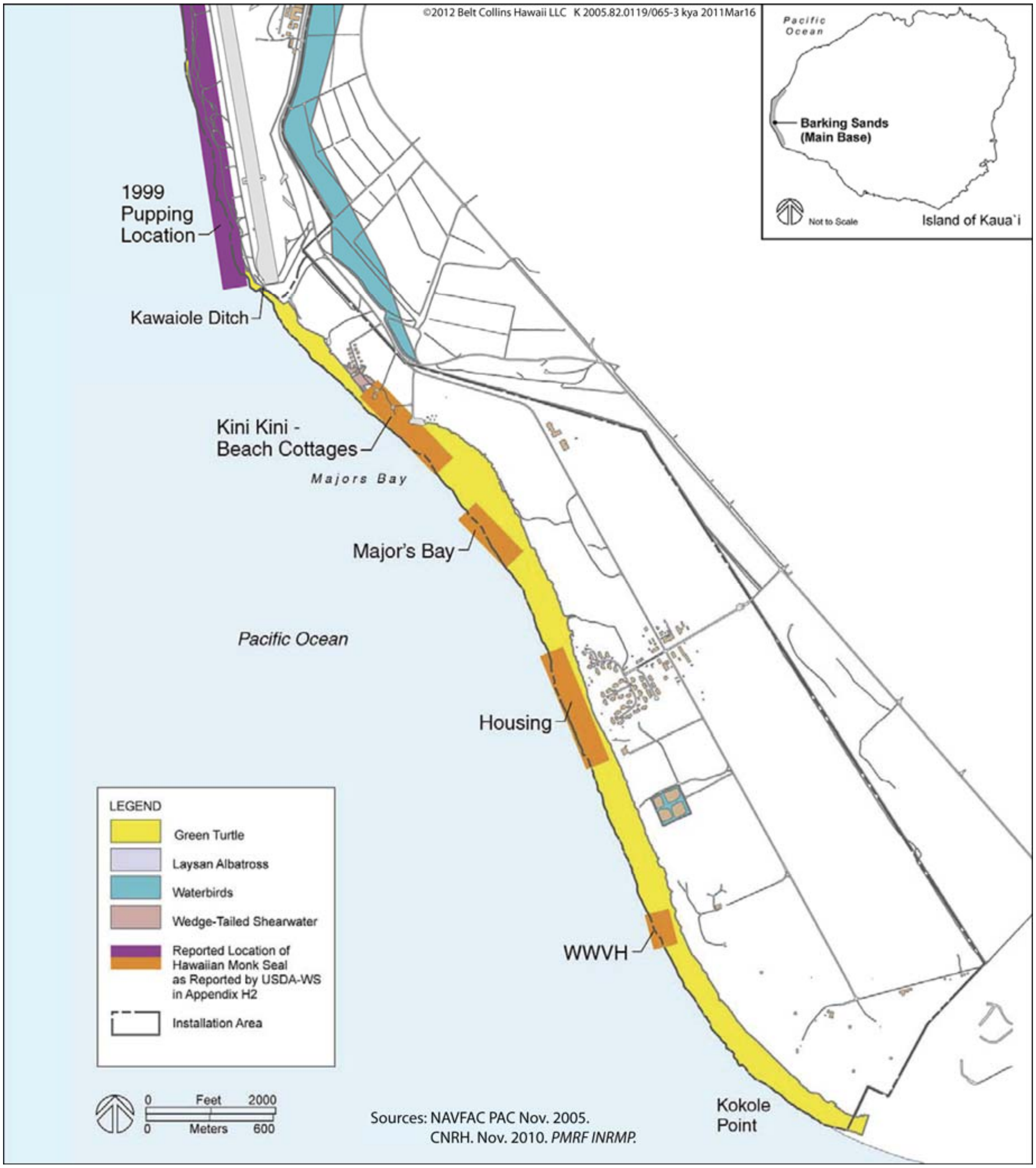
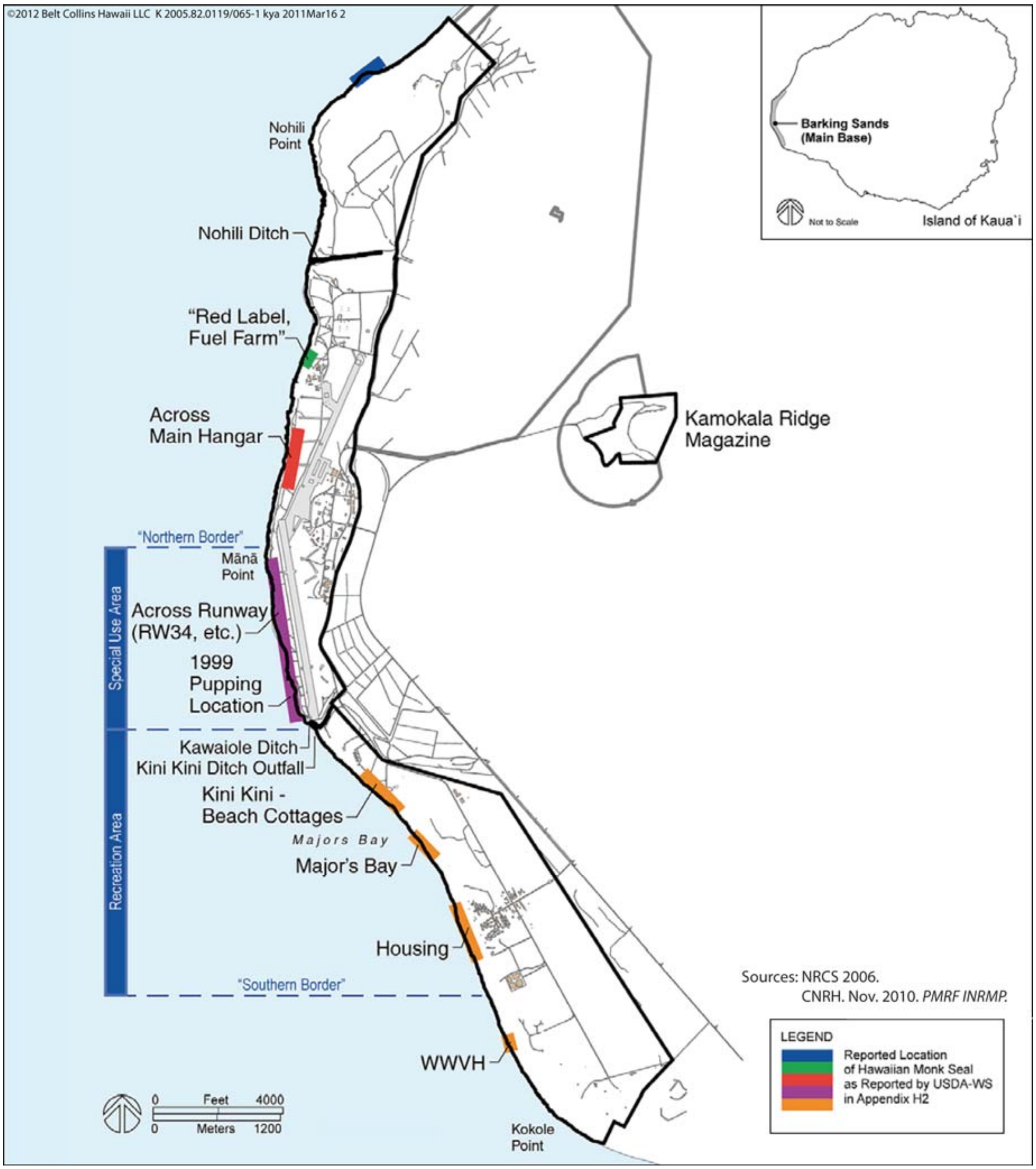


Figure 4-5. Selected Listed Faunal Species, PMRF Southern Area



1
2 **Figure 4-6. PMRF Reported Hawaiian Monk Seal Locations**

Habitat

Critical Habitat. In 2008, the USFWS designated critical habitat[26] for the endangered lauehu (*Panicum niihauense*) at Polihale State Park, north of the range, and in sections of PMRF. Although this plant is not found at PMRF, the USFWS has determined that land on PMRF adjacent to Polihale State Park and dune areas along the southern portion of the range contain primary constituents necessary for the recovery of lauehu. The USFWS designated these areas as unoccupied critical habitat because there are not enough other areas outside the base that contain the elements to achieve the USFWS's goal of 8 to 10 populations.[27]

Jurisdictional Wetlands. No wetlands delineated by USACE or included in USFWS wetland inventories exist at PMRF. However, several man-made oxidation ponds and ditches support protected bird species. The freshwater discharge at Nohili Ditch appears to be at least partially responsible for the preferred turtle foraging habitat since it stimulates filamentous algae growth on the near shore reef bench.[28] Wetland areas exist adjacent to but outside of the range boundaries, including the Kawaiele Wildlife Sanctuary (a State Waterbird Refuge for Hawaii's four endangered waterbird species, located east of the southern end of PMRF's airfield).

Coral Reefs. PMRF nearshore waters were surveyed for coral reefs and other marine resources in 2000 and 2007 to provide information for the INRMPs dated October 2001 and November 2010. Part of the runway to be used by the squadrons is located on land fronting what is called the Mana Point Sector in the marine environmental surveys (CNRH 2010, Dollar and Brock surveys). In this sector, offshore of the runway, living corals are more sparsely distributed than the Nohili Sector to the north, which contains more coral cover than anywhere else in the study area. Corals in the Mana Point Sector occur predominantly as flat encrustations on the flat bottom. Continual wave action appears to limit coral growth on the reef platforms, and coral cover is substantially lower here than in the Nohili Sector. Solitary colonies of *Porites lobata* and *Pocillorpora spp.* are the most abundant species in the Mana Point Sector (CNRH 2010, 3–47).

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[26] Critical habitat is defined under the Endangered Species Act as: (1) Specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological feature essential to conservation, and those feature may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determined that he area itself is essential for conservation.

[27] PMRF, 2001; 2007; USFWS, 2003a) from the PMRF. April 2010. PMRF Intercept Test Support EA/OEA. Pg. 3-14.

[28] U.S. Department of the Navy, Commander, Navy Region Hawaii (CNRH). 2007 from the Apr 2010, PMRF Intercept Test Support EA/OEA, pg. 3-14.

Existing Management Measures

This section discusses existing measures implemented by PMRF to address issues relating to biological resources.

Integrated Natural Resources Management Plan and Other Management Actions. PMRF implements ongoing control, management, and monitoring programs to safeguard protected species and other natural resources at the base. These include the following measures:

- Predator control (by USDA Wildlife Services personnel) to protect native species from feral animals, barn owls, deer, and pigs.
- Utilizing a "Natural Resources Incident Checklist" for correct staff actions to be taken in the event of a protected species incident at PMRF.
- Management and monitoring projects:
  - Measures to prevent Newell's shearwater and Hawaiian petrel tower/antenna strikes and fallout due to lighting conditions, including installation of green lighting and shielding to deter bird attraction and reduce bird disorientation, and training on the proper banding/handling of birds at the onset of the shearwater fledging season.
  - Protection of wedge-tailed shearwater burrowing near the PMRF Beach Cottages.
  - Short-tailed albatross visual survey and management actions.
  - Waterbird species, nene, and green sea turtle monitoring and daily USDA Wildlife Services reporting and patrols.
  - Implementation of requirements related to the use of radar units for protection of the Hawaiian hoary bat.
  - Coordination with federal stakeholder agencies for the Hawaiian monk seal recovery, and compliance with federal decisions related to training activities (missile launches and expeditionary assault landings).[29]
- Participating in the federal Interagency Marine Debris Coordinating Committee and the National Marine Debris Monitoring Program.
- Restricting shoreline access (instituted to address security), which has benefited protection of beach habitat for several species.

[29] NOAA Fisheries. 2008. Final Programmatic Biological Opinion on U.S. Navy Activities in the Hawaii Range Complex 2008-2013 and DON. Dec 2008). Hawaii Range Complex FEIS/OEIS.

- Preventing and controlling invasive species introduction through coordination with the State Department of Health, U.S. Customs, and Department of Agriculture quarantine officers for inspection of incoming flights to PMRF, vehicle wash-downs, SOPs for personnel training, and natural resources educational information for personnel relocating to PMRF.
- Restoring the dunes.

Bird Aircraft Strike Hazard (BASH). PMRF Instruction 5090.7A: BASH Plan was created to establish procedures to minimize risk of air strikes involving resident and migratory bird species. PMRF contracts USDA Wildlife Services for BASH control. Current management actions with respect to protected species and BASH include the following (CNRH 2010, Pp 3-56-70):

- Waterbirds found primarily in the Kinikini Ditch and PMRF oxidation ponds do not pose BASH hazard; they are sedentary and have restricted terrestrial habitat use.
- The nene population on Kauai and at PMRF is expected to increase. A nene management plan is being prepared to address methods to discourage nene from the PMRF airfield.
- Laysan albatross are considered a BASH hazard due to their nesting proximity to the airfield. PMRF has communicated with USFWS and developed management strategies outlined in a 2009 NAVFAC report, including removing eggs and adults in the immediate vicinity of the airfield and translocating subadults to breeding colonies on Kauai's North Shore. Policies for black-footed albatross, if sighted, would be similar.

Invasive Species. Invasive plant and animal species are a control concern at PMRF. The airstrip is a potential port of entry for invasive plant and animal species that may adversely affect natural resources. All inbound flights carrying cargo from areas outside of Hawaii and landing at Barking Sands are advised to inspect and secure cargo in accordance with OPNAVINST 6210.2, Quarantine Regulations of the Navy prior to shipment to ensure that it is free of invasive species. All Navy and contractor vehicles are required to be washed down prior to mobilization to Barking Sands and other PMRF facilities and are washed down again after completion of activities in order to minimize the potential for introducing alien and/or invasive species. PMRF maintains SOPs for personnel training and provides natural resources information to personnel relocating to PMRF. Information is provided on the effects of alien plant and animal species to native ecosystems, as well as threatened and endangered or otherwise protected species (CNRH 2010).

Wildland Fires. Historically there have been no wildland fires at the PMRF main base at Barking Sands. The base operations support contracted fire department would respond to any fires at the facility (CHRH 2010).

4.8.2.5 Training Areas on the Islands of Molokai and Maui

Terrestrial Flora

Molokai Training Support Facility (MTSF). There are no natural habitats or features at MTSF that require protection. No ESA- or State-listed or candidate species are known to occur at MTSF (Drigot, Wilcox, and Druin 2001). Brief descriptions of the areal extent of each LZ and their surface conditions, such as vegetation, are presented in the table in Appendix B-2.

Kalaupapa Airport. No ESA-listed endangered, threatened or candidate plant species are known to occur within the paved airport area. In surveys conducted as part of an EIS for the State of Hawaii Department of Transportation, Airports Division, lands immediately surrounding the airport were observed to be covered by beach naupaka (*Scaevola taccada*) and a variety of grasses and native coastal plants. Christmas berry (*Schinus terebinthifolius*) and ilima (Sida fallax) were also abundant. Trees in the area included kiawe (*Prosopis pallida*), ironwood (*Casuarinas spp*.), Cook pine (*Araucaria columnaris*), and tree heliotrope (*Messerschmidia argentea*) (EKNA 1991).

HIARNG Facility. Existing vegetation at the HIARNG Facility is characterized by kiawe (*Prosopis pallida*) and other dry shrubs and grasses. There are no known ESA-listed plant species in the vicinity (HIARNG 2001). A brief description of the areal extent of the LZ and its surface condition, such as vegetation, is presented in the table in Appendix B-2.

Terrestrial Fauna

Molokai Training Support Facility. No natural habitats or features at MTSF require protection. There are no known ESA- or State-listed or candidate species at MTSF (Drigot, Wilcox, and Druin 2001).

Kalaupapa Airport. Two faunal surveys were conducted to support an EIS prepared for the State Airports Division—the first survey on March 17-19, 1989, and the second on May 22-24, 1989 (EKNA 1991). No ESA-listed bird or mammal species were recorded during these surveys. Although the Hawaiian hoary bat (*Lasiurus cinerus semotus*) may occur on Molokai, no bats were recorded at the site during two nights of observation.

The National Park Service (NPS) reports the presence of listed marine species at Kalaupapa, including endangered humpback whales (*Megaptera novaeangliae*) during winter and early spring months[30]; Hawaiian monk seals (*Monachus schauinslandi*) throughout the year and especially during spring and summer months, using Iliopii Beach as a pupping area and Hoolehua Beach as a haulout site; and threatened green sea turtles (*Chelonia mydas*) throughout the year in nearshore water. NPS also reports that two seabirds—threatened Newell's shearwater (*Puffinus auricularis*) and endangered Hawaiian petrels (*Pterodroma sandwichensis*)—breed up in the valleys but may transit the airport vicinity to forage in nearshore waters.[31]

The following MBTA-listed species were recorded during the 1989 surveys referenced above: Pacific golden plover (*Pluvialis fulva*), ruddy turnstone (*Arenaria interpres*), wandering tattler (*Heteroscelus incanus*), great frigatebird (*Fregata minor*), red-footed booby (*Sula sula*), wedge-tailed shearwater (*Puffinus pacificus*), red-tailed tropicbird (*Phaethon rubricauda*), and white-tailed tropicbird (*Phaethon lepturus)*. In addition, NPS reports that the black noddy (*Anous minutes*) nests in rookeries aong the eastern side of the peninsula in close proximity to the airport.[32]

HIARNG Facility. Animals found at the HIARNG facility are similar to those found in the urbanized areas of nearby Kihei, including exotic species of birds such as the house finch, northern cardinal, and gray and black francolin. There are no known ESA-listed or candidate species of fauna at the facility (HIARNG 2001).

Invasive Species

No invasive plant species have been identified on land within the airport, composed primarily of paved runway and mowed grass. Kiawe (*Prosopis pallida*) and Christmas berry (*Schinus terebinthifolius*) were identified in a survey of the airport and surrounding lands being considered for roadway and wharf improvements (EKNA 1991).

Habitat

Critical Habitat

Molokai Training Support Facility. There is no designated critical habitat at or in the vicinity of MTSF.

Kalaupapa Airport. No critical habitat is located in the airport vicinity (FR March 2003).

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[30] Waters offshore from Kalaupapa Airport are not in the Hawaiian Islands Humpback Whale National Marine Sanctuary.

[31] Letter from Stephen Prokop, Superintendent, Kalaupapa National Historic Park, December 27, 2011

[32] Letter from Stephen Prokop, Superintendent, Kalaupapa National Historic Park, December 27, 2011

HIARNG Facility. There is no designated critical habitat at the HIARNG facility.

Jurisdictional Wetlands

Molokai Training Support Facility. There are no wetlands located within or in close proximity to MTSF.

Kalaupapa Airport. No wetlands are located within or in close proximity to Kalaupapa Airport (EKNA 1991).

HIARNG Facility. There are no wetlands located within or in close proximity to the HIARNG facility (HIARNG 2001).

Coral Reefs

MTSF and HIARNG. There are no coral reefs located at HIARNG or MTSF, as these are not coastal sites.

Kalaupapa Airport. A marine environmental baseline survey was conducted in nearshore waters adjacent to Kalaupapa Airport as part of the EIS prepared for the State DOT Airports Division. The area fronting the runway is characterized by a basaltic shoreline that drops sharply in a vertical cliff face at depths of approximately 16 to 50 ft (5 to 15 m). At the foot of the cliff and extending offshore for distances of at least 1,600 ft (500 m) and to water depths of at least 98 ft (30 m) is a bottom composed of large basaltic boulders interspersed with areas of flat basaltic pavements. Surfaces of the boulders and shoreline cliff-face are relatively devoid of attached benthic organisms due to extreme turbulence during the winter months.

Coral cover at all six transects surveyed was extremely low, ranging from three to six percent. (Four of the transects were located in the vicinity of the runway; two were located southwest of the runway to serve as a control site.) Seven species of corals were encountered, with species per transect ranging from two to four. *Porites lobata* and *Pocillopora meandrina* comprised 89 percent of all coral cover. Corals encountered were all small, flat encrustations, as high wave action has prevented planular settlement and growth of adult colonies (EKNA 1991).

Existing Management Measures

The new squadrons would comply with existing MCB Hawaii plans and SOPs regarding natural resource protection, BASH, invasive species, and wildland fires when conducting aviation training at MTSF. These are listed below. When training at the HIARNG facility and at the State's Kalaupapa Airport, the squadrons would also comply with applicable Hawaii Army National Guard and State Airports Division requirements, respectively.

Integrated Natural Resources Plan (INRMP). The 2002-2006 Marine Corps Base Hawaii Integrated Natural Resources Management Plan (currently being updated) covers all Marine Corps properties in Hawaii, including MTSF (see Section 3.8.2). Since the facility contains no significant natural resources and has been inactive, it is minimally discussed in the INRMP. However, as proposed training activities occur, measures in the INRMP would apply.

MCBH Environmental Compliance and Protection Standard Operating Procedures (ECPSOP). The ECPSOP, updated in December 2005, includes natural resources management SOPs (see Section 3.8.2).

Bird Aircraft Strike Hazard (BASH). BASH risk would be managed through air crew compliance with established Marine Corps aviation safety procedures, including avoiding high-hazard situations and determining if altering or discontinuing operations are required.

Invasive Species. Marine Corps Base Hawaii SOPs designed to prevent the spread of invasive species during training activities would apply to MTSF (see Section 3.8.2).

Wildland Fires. Wildland fire management plans and fire response protocols incorporated into SOPs for Marine Corps training areas would apply to MTSF (MCBH 2006a).

4.8.3 ENVIRONMENTAL CONSEQUENCES

The Department of the Navy conducted informal consultation with the USFWS in compliance with ESA Section 7 requirements. A letter and Biological Evaluation (BE), dated November 14, 2011, were sent to the USFWS, stating that DoN had made a "no effect" determination for MV-22/H-1 training for the one ESA-listed plant species, *Stenogyne angustifolia*, recorded in the vicinity of a landing zone at PTA. In addition, DoN made a "no effect" determination for the listed species *Branta sandvicensis* or nene at PTA. The majority of the nene at PTA are present in the impact area (Training Range 1). None of the LZs are within the impact area. Nene have been observed occasionally flying over other areas of PTA; however, they have not been observed on the ground at or near the LZs proposed for use by the VMM and HMLA squadrons. Regarding the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) at the Army's Oahu training areas and at PTA, DoN submitted a determination of "may affect, but not likely to adversely affect (NLAA)."

During informal Section 7 consultation discussions, DoN changed its determination for the nene at PTA and requested USFWS concurrence that the proposed action is not likely to adversely affect nene. Conservation measures issued by USFWS to PTA under a Biological Opinion will be followed by the Marine Corps to prevent nene interaction during training. Based on minimization and avoidance measures discussed and information provided by DoN, USFWS concurred in a letter dated February 17, 2012, that the proposed training may affect but is not likely to adversely affect the nene. In this same letter, USFWS concurred with DoN on the determinations submitted for *Stenogyne angustifolia* and the Hawaiian hoary bat. DoN has agreed to follow the existing conservation measures outlined in the applicable Biological Opinions for Army training areas on Oahu and at PTA (USFWS 2003). In addition, as the Army is proposing to reinitiate the Biological Opinion for PTA, future Marine Corps actions would be subject to implementation of any revised conservation measures for the nene at the conclusion of that consultation.

Copies of correspondence with USFWS are presented in Appendix J. Specific avoidance and minimization measures are listed in the USFWS letter dated February 17, 2012.

4.8.3.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

Construction Impacts

Any clearing and grubbing needed to improve existing LZs would not affect protected plant species, as no ESA-listed species have been recorded at MCTAB. Under the proposed action, improvements to the LZs would be completed in compliance with existing regulatory requirements. BMPs would be implemented for erosion and sediment control prior to and during construction to prevent sediment runoff outside the construction sites. No wetlands are located in the vicinity of the LZs to be improved, and none of these LZs are located along the shoreline close to coastal waters. There would be no construction with the No Action Alternative and, hence, no construction impacts. Therefore, no adverse effects are expected with any of the alternatives. No mitigation is required.

Operational Impacts

ESA-listed and MBTA-listed bird species are found at MCTAB. MCB Hawaii's INRMP describes management practices in place to ensure protection of these species on MCB Hawaii installations, including MCTAB. BASH risk may increase at MCTAB due to the expected increase in aviation training with introduction of MV-22s and H-1s, but the risk would be managed through compliance with procedures by air crews to avoid high-hazard situations and determine whether to alter or discontinue operations. Other SOPs are intended to avoid or minimize aviation training impacts at MCTAB, including SOPs designed to monitor, control, and prevent the transport of invasive species, as well as wildland fire management and response protocols applicable at Marine Corps training areas. MV-22 aircraft operating with exhaust deflectors would be using paved LZs, further reducing fire risk. No mitigation is required. No impacts on natural resources would be associated with the No Action Alternative.

4.8.3.2 Army Training Areas on the Island of Oahu

Construction Impacts

No construction is planned at the Army training areas on Oahu.

Operational Impacts

ESA-listed plant species occur at the Army training areas on Oahu. None are documented within or near the LZs proposed for aviation training. ESA-listed faunal species are documented at KLOA and SBER. A survey conducted as part of this EIS confirmed the presence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) at LZ Elephants Foot at KLOA and indicated the probable but unconfirmed presence of the Hawaiian hoary bat at LZ Ku Tree at SBER. No ESA-listed faunal species are documented at KTA or DMR. MBTA-listed species are known to occur at KTA, KLOA, SBER, and DMR.

Of the 20 plant species and three insect species proposed by the USFWS for ESA protection, none are likely to be affected by the proposed training activities. The candidate species range and current populations were analyzed to determine whether they may occur in the vicinity of the LZs proposed for aviation activities by the squadrons. The analysis is presented in Appendix F-4. Fourteen candidate plant species exist outside the areas proposed for training where no LZs proposed for use are located. Six candidate plant species may occur within the training areas but not at the LZs due to elevation, highly disturbed environment, dominance of non-native species, and/or habitat that would not support the species. The three damselfly species proposed for ESA-listing breed in streams or pools. The LZs are all located on mountain ridges or plateaus; none are near streams or pools required to support these species.

Natural resources management programs are currently in place through USAG-HI's Oahu INRMP, Biological Opinion, and other directives to protect ESA- and MBTA-listed species. During training, the squadrons would follow measures as required by regulations and SOPs to avoid impacts to listed species, minimize BASH risk, prevent the spread of invasive species between training areas, and prevent wildfires. In addition, exhaust deflectors on MV-22 aircraft would reduce the risk of fire at unpaved LZs. Other operational measures are available to further minimize the already remote risk of fire, such as avoiding bushes or brush directly beneath the aircraft and limiting time the aircraft is on deck at unpaved LZs. With implementation of these measures, there would be no adverse impacts on protected species under the proposed action. No effects are expected due to the proposed action or the No Action Alternative. No mitigation is required.

4.8.3.3 Pohakuloa Training Area (PTA), Island of Hawaii

Construction Impacts

The LZs are characterized by ruderal vegetation and/or bare ground with remnant patches of native vegetation. Landing zone improvement under the action alternatives would result in a minor amount of vegetation removal and no loss of wildlife habitat. No construction would occur in designated critical habitat areas. Construction impacts would be minimal. No mitigation is required. The No Action Alternative would involve no construction and, therefore, no construction impacts.

Operational Impacts

ESA-listed plant and animal species occur at PTA, including the creeping mint (*Stenogyne angustifolia),* Hawaiian hoary bat (*Lasiurus cinereus semotus*) and nene/Hawaiian goose (*Branta sandvicensis*). MBTA-listed birds are also found here. Natural resources management programs are currently in place through the PTA INRMP to protect these species. During training, the squadrons would follow measures as required by regulations and SOPs to avoid impacts to ESA-listed and MBTA-listed species. With continuation of compliance with existing management measures to address BASH, invasive species, and wildland fires, no effects are expected due to the proposed action or the No Action alternative, and no mitigation is required. In addition, exhaust deflectors on MV-22 aircraft would reduce the risk of fire at unprepared LZs. Additional operational measures to further minimize the already remote risk of fire include avoiding bushes or brush directly beneath the aircraft and limiting time the aircraft is on deck at unpaved LZs. With the No Action Alternative, there would be no training by the VMM and HMLA squadrons at PTA and no operational impacts.

4.8.3.4 Pacific Missile Range Facility (PMRF) on the Island of Kauai

Construction Impacts

No construction is planned at PMRF.

Operational Impacts

Aircraft would be landing at and taking off from the paved airfield and landings zones. Natural resources management programs are currently in place to protect ESA-listed and MBTA-listed species at PMRF. Few if any impacts are expected with any of the alternatives, and no mitigation is required. With continuation of existing management measures to address BASH, invasive species, and wildland fires, no significant impacts are expected due to any of the alternatives being considered. No mitigation is required. No operational impacts would be associated with the No Action Alternative.

4.8.3.5 Training Areas on the Islands of Molokai and Maui

Construction Impacts

No construction is proposed at Kalaupapa Airport or the HIARNG facility. Clearing, grubbing, grading, and paving are proposed at MTSF. No ESA-listed plant or animal species are known to occur at MTSF. BMPs would be implemented to prevent sediment runoff. No mitigation is required. No impacts on natural resources would be associated with the No Action Alternative.

Operational Impacts

No ESA-listed plant or animal species are known to occur at either MTSF or the HIARNG Facility. Operations at MTSF would occur on paved surfaces. The HIARNG facility has a paved helipad. No impacts on natural resources are anticipated during operations. No mitigation is required. With the No Action Alternative, there would be no impacts on natural resources.

No ESA-listed or MBTA-listed plant or animal species are known to occur within the immediate vicinity of Kalaupapa Airport. Under the action alternatives, the 65 dB DNL noise contour would remain within the airport and the immediate surrounding area. Aviation activities would have no impact on coastal vegetation used by Pacific golden plover for feeding and foraging. With regard to Newell's shearwaters and Hawaiian petrels, a threat to these species results from their attraction to lights, which cause them to become disoriented and to crash. This would not be an issue with night vision training at the unlighted airport.

ESA-listed marine species are known to frequent offshore waters at Kalaupapa, including the endangered humpback whale and Hawaiian monk seal and threatened green sea turtle. Current aviation operations have had no significant impacts on these species, and MV-22 and H-1 operations are not expected to have any significant impacts as well.

Offshore waters at Kalaupapa are not within the Hawaiian Islands Humpback Whale National Marine Sanctuary, which is located off the south coast of Molokai. Humpback whales observed off Molokai are most frequently found in waters off the northeast coast of the island. Furthermore, humpback whales at Kalaupapa have generally not been seen in water depths less than 30 feet (9 meters) and are more likely to be found in depths greater than 45 feet (13.7 meters).[33]

Beaches on the peninsula known as monk seal pupping and hauling out areas would be outside the 65 dB DNL noise contour under the action alternatives. It is noted that green sea turtles are found in waters adjacent to airfields with more frequent operations than Kalaupapa Airport, including Honolulu International Airport and PMRF.

There would be no impacts on natural resources at Kalaupapa Airport under the No Action Alternative.

4.9 CULTURAL RESOURCES

4.9.1 INTRODUCTION

This section discusses archaeological and traditional cultural resources at training facilities outside of MCB Hawaii Kaneohe Bay: MCTAB and Army training areas on Oahu, PTA on the island of Hawaii, PMRF on Kauai, MTSF and Kalaupapa Airport on Molokai, and the HIARNG Facility on Maui.

The area of potential effect (APE) for NRHP-eligible archaeological resources and traditional cultural resources is presented for each training area

Definitions of archaeological and traditional cultural resources, as used in this EIS, are given in the Cultural Resources section in Chapter 3 (see Section 3.9.1). Also presented in Section 3.9.1 are the criteria for evaluating site significance, based on the National Historic Preservation Act (NHPA) (as detailed in 36 CFR Part 60.4).

As there are no buildings eligible for listing in the National Register of Historic Places (NRHP) within the APE at the LZs, DZs, and airfields at the other training areas, the following analysis focuses on archaeological resources and cultural sites.[34]

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33 National Park Service, U.S. Department of the Interior, Kalaupapa National Historic Park. August 2010. *Project to Repair the Kalaupapa Dock Structure, Environmental Assessment.*

34 The draft USAG-HI Integrated Cultural Resource Management Plan (2001) lists several 1955-1956 “hutments” at PTA, presumed to be Quonset-type buildings. These are described as potentially eligible for the NRHP; the buildings would have to be evaluated for eligibility.

4.9.2 AFFECTED ENVIRONMENT

4.9.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

Areas of Potential Effect

The proposed action includes aviation training at four landing zones and one drop zone at MCTAB, as well as construction of improvements to these existing facilities. The four LZs are on abandoned World War II era runways: LZs Owl and Noni are on Runway 3R-21L, LZ Hawk is on Runway 12-30 in the southern portion of MCTAB, and LZ Gull is on Runway 3L-21R in the northern area of MCTAB. DZ Tiger is located in the triangular-shaped open area south of Building 700. All LZs and DZs are currently in use for training by other types of aircraft.

The APE for archaeological resources and traditional cultural resources eligible for NRHP-listing encompasses an area defined by the LZ or DZ and a surrounding 350-ft (107-m) buffer. The buffer zone is intended to accommodate potential impacts from physical improvements to the landing and drop zone, as well as rotor downwash from the MV-22.

Historic Context

MCTAB falls within the ahupuaa (traditional land division) of Waimanalo at the southern end of the windward traditional district of Koolaupoko. Archaeological evidence suggests that the area was settled as early as AD 1040-1219 (Dye and Pantaleo 2010:116). Permanent occupation developed along central and upper Puha Stream, the main stream in the ahupuaa; this was the highly productive region for the Hawaiian staple, irrigated taro (*Colocasia esculenta*) (Tuggle 1997:8).

On the coastal plain away from Puha Stream, Hawaiians cultivated dryland crops such as sweet potato (*Ipomoea batatas*), fished, and collected shoreline resources. They built temporary habitation camps or field houses among the gardens. Although there are no known shrines or temples in the lowland area, Tuggle (1997:54) asserts that “it is unlikely that Hawaiians would have fished or practiced agriculture without making offerings in a variety of ways.” He suggests that pig and dog burials excavated at Site 4853 on the north side of lower Puha Stream “could be part of such dedications.”

Burial activity at the coast and inland dunes occurred throughout the history of Waimanalo’s occupation.

The late 18th century was a time of inter-island battles, particularly between the ruling chiefs of Oahu and Maui. There are several historical references to fighting that occurred in the Waimanalo area in the years just after European Contact, including one for which preparations for battle occurred at the mouth of Puha Stream (see Tuggle 1997:12-13 for analysis of traditional accounts and place names).

Settlement and land use in the historic period can be extrapolated from information in mid-19th century records related to the Mahele or land division of 1848 and Land Commission awards. The ahupuaa of Waimanalo was claimed as Crown Lands during the Mahele, and 103 kuleana or Land Commission awards (LCAs) were made to commoners in the ahupuaa. Most of the LCAs were located in central and inland Waimanalo, although there were several along lower Puha Stream where marshy, stream-side areas were used for taro cultivation, as well as for aquaculture.

During the second half of the 19th century, the expansive Hawaiian irrigation systems along Puha Stream gave way first to ranching, then to rice cultivation, and finally to commercial sugar operations. In 1850, Englishman Thomas Cummins obtained a 50-year lease from the Kingdom of Hawaii and established Waimanalo Ranch, engaged in breeding cattle, horses, and sheep. Cummins' son, John, converted the ranch to sugar cultivation, and by 1881, sugarcane was being grown on about 1,000 ac (405 ha). Rice was being grown by independent Chinese farmers, who eventually also transitioned to sugarcane cultivation. During the late 19th century, the plantation developed cane fields and support infrastructure on the coastal plain. On the south side of Puha Stream were a church and school, as well as a cemetery for Japanese laborers (Tuggle 1997:24-25).

In 1917, Presidential Executive Order 2565 established the Waimanalo Military Reservation on approximately 1,500 ac (607 ha) formerly held by the plantation. By this time, much of the coastal plain was in scrub or pasture. By 1933, a runway had been constructed, and the reservation was given the name Bellows Field, to commemorate 2nd Lieutenant F. B. Bellows who had been killed in an air accident in France during World War I. During the 1930s, Bellows Field was used for strafing and bombing practice by Army Air Corps detachments from Wheeler Field in central Oahu and for target practice by coastal artillery.

On the morning of December 7, 1941, Japanese fighters attacked Bellows Field. In the days that followed, the military quickly mobilized. One of the two runways was expanded in less than a week to accommodate the arrival of B-17 bombers from the mainland (USACE 2006:3-41). Much of Bellows Field was leveled or filled, revetments were constructed to protect aircraft, and the runway was expanded to accommodate B-17 bombers.

After the war, the U.S. Air Force was established as an independent service and the Army Air Corps Bellows Field was renamed Bellows Air Force Base (BAFS). It was subsequently redesignated Bellows Air Force Station (BAFS) when its runways were closed in the late 1950s. Intervening years saw development of a transmitter complex and construction of two Nike-Hercules surface-to-air missile sites in 1960. The Nike site was closed in 1970.

U.S. Marine Corps use of Bellows began in 1951, when the runway was the site of air-to-ground training. This training has expanded to include much of the coastal Waimanalo Plain, with amphibious, helicopter, and motorized exercises in conjunction with troop land maneuver training. In January 2000, the Air Force transferred approximately 1,049 ac (425 ha) of BAFS to the Marines, and the facility was redesignated Marine Corps Training Area Bellows (MCTAB).

Archaeological and Cultural Surveys

There has been considerable archaeological work at MCTAB and the adjacent BAFS. Archaeological investigations within and in the vicinity of the proposed MCTAB LZs and DZ are listed in Table 4-39. Projects adjacent to the LZs are included because they provide a context for assessing effects on sites within the APEs.

Table 4-39. Previous Archaeological Investigations in and near APEs at MCTAB

Author	Date	Description of Work	Location	Findings Pertinent to LZs
Leidemann and Cleghorn	1983	monitoring	LZ Hawk	Scattered historic debris (bullet casings, glass/ceramic fragments) observed on east side of runway
			LZ Owl	Six feature areas, artifact and midden-rich cultural deposits, human remains (Site 4851)
			DZ Tiger	Area had been graded prior to survey; no cultural material observed
Barrera	1984	test borings construction monitoring	LZ Hawk	Antenna 3 trench—four in situ burial pits on SW side of runway; Antenna 4—pits and firepits, also basalt lithics, cut bone; organic layer suggests wet or marshy conditions
		monitoring	LZ Owl	Antenna 2—no cultural material observed
Hurlbett and Haun	1987	survey	LZ Gull	Site 3309
Athens	1988	recon survey testing	LZ Hawk	Stratigraphic Trench 4 at north edge of LZ Hawk—no cultural material
Hammatt and Shideler	1989	subsurface testing	LZ Owl	Trenches 12-14—buried A-horizon with no cultural materials; Trench 3 in middle of north end of runway—disturbed deposit with some cultural material 48 cm bs, intact deposit with basalt, midden from 74 cm bs

Table 4-39. Previous Archaeological Investigations in and near APEs at MCTAB

Author	Date	Description of Work	Location	Findings Pertinent to LZs
			LZ Hawk	Trenches on south side of runway—buried A-horizon with no cultural material
			LZ Noni	Trenches in middle of runway—no cultural material
			DZ Tiger	Trenches in middle of runway—no cultural material
Dye	1998	subsurface testing	LZ Owl	Trench at west edge of runway—cultural deposit under 100 cm of fill; basalt lithics, no features; Transect 4 trench—discontinuous cultural deposit with traditional, 19th century artifacts, faunal material, four features, basalt indicating lithic workshop
Erkelens	2000	monitoring data recovery	LZ Hawk	UST removal just south of Building 700—charcoal-stained deposit100-150 cm bs
Addison	2001	test excavations	LZ Gull	Trenches BT-12 and 16—60 to 95 cm of fill; disturbed sand layer w/ charcoal flecking (possibly related to 19th century sugar cultivation); no other cultural materials
Desilets and Dye	2002	monitoring	LZ Gull	Location 5— no cultural deposits in 3 m deep pipeline trench across Runway 3L-21R; three pit features found in trench within 150 ft of east side of runway
Petersen et al.	2004	subsurface testing	DZ Tiger	No intact cultural materials in 26 backhoe trenches
Puette and McElroy	2004	subsurface testing	LZ Owl	Trench A and test unit on north side of runway—intact cultural deposit with numerous basalt artifacts, midden, pit features (including unusual coral slab-line firepit)
Major and Dye	2006	subsurface testing	LZ Owl	Three shovel tests on north side of runway, at south end of the LZ Owl—cultural deposit about 35 cm bs
			LZ Hawk	Five shovel tests at northwest corner of LZ—possible cultural deposit at 80 to 90 cm bs, under coral fill and secondary deposits
			DZ Tiger	Five shovel tests through middle of DZ—no cultural materials; compacted coral fill from 20 to 60 cm bs
Rasmussen	2008	archival research, assessment	LZ Noni LZ Owl LZ Hawk	Background research and assessment of WWII southern runway complex; recommends that the complex no longer retains its integrity and therefore is not eligible for listing in the NRHP.
Walker and Morrison	2010	GPR survey	LZ Owl LZ Hawk DZ Tiger LZ Gull	See Cochrane 2011 for testing of GPR anomalies.

Table 4-39. Previous Archaeological Investigations in and near APEs at MCTAB

Author	Date	Description of Work	Location	Findings Pertinent to LZs
Cochrane	2011	subsurface testing	LZ Owl	Trenches 1-5, 36, and 37—generally 50 to 98 cm of fill; no cultural material in underlying deposits.
			LZ Hawk	Trenches show 80 cm of fill over disturbed sand layer; 40 cm of fill over undisturbed, non-cultural sand; base of excavation at 131 to 134 cm bs
			DZ Tiger	Trenches 20 and 38—45 to 100 cm of asphalt and fill over undisturbed, non-cultural terriginous deposit
			LZ Gull	Trench 10—60 cm of runway asphalt and fill over undisturbed, non-cultural terriginous deposit

The area of the southern runways, including LZs Owl, Hawk, and Noni, and DZ Tiger, has been extensively studied since the early 1980s. The first archaeological project in this area (Leidemann and Cleghorn 1983) documented a traditional Hawaiian cultural deposit (Site 4851) containing artifacts, midden, and human remains, as well as scattered historic debris (bullet casings, glass/ceramic fragments). The project also recorded a historic cemetery (Site 3312) north of Runway 3R-21L. Based on these results, subsequent investigations to further identify site boundaries and character were carried out in response to proposed development (e.g., Barrera 1984; Erkelens 2000; Dye 1998; Major and Dye 2006; Walker and Morrison 2010; Cochrane 2011). Rasmussen (2008) provided historical background and an assessment of the southern runway complex.

Several projects that included the area of DZ Tiger found no intact cultural remains (e.g., Leidemann and Cleghorn 1983; Hammatt and Shideler 1989). Most notably, Peterson et al. (2004) excavated 26 backhoe trenches in this area and found no intact cultural materials.

The area of the northern runway, including LZ Gull, has not been as intensively studied as the southern runway complex, although there have been several projects in the vicinity (Hurlbett and Haun 1987; Addison 2001; Desilets and Dye 2002; Cochrane 2011). Hurlbett and Haun (1987) identified one site near LZ Gull, a complex of features related to historic period commercial sugar cultivation, including a water catchment basin, irrigation channels, and plow furrows (Site 3309). Notably, Desilets and Dye (2002) monitored excavation of a 10-foot (3-meter) deep pipeline trench across the width of the runway and found no cultural deposits under the runway.

1 Table 4-40 summarizes the cultural resources characteristics of the APEs at MCTAB, based on
2 findings of the surveys described above.

Table 4-40. Cultural Resources Characteristics of the APEs at MCTAB

APE	Survey Completeness	Sites w/in APE	Probability for Addl Arch Sites	Basis for Probability Evaluation	References
Noni	complete	none	no	Heavily graded area; evaluation based on analysis of previous research that found no subsurface deposits; Major and Dye 2006 sensitivity areas.	Hammatt and Shideler 1989; Hurlbett and Haun 1987; Rasmussen 2008
Gull	complete	3309	yes	May also be at northern edge of Site 4853; Major and Dye 2006 sensitivity areas.	Hurlbett and Haun 1987; Addison 2001; Desilets and Dye 2004; Walker and Morrison 2010; Cochrane 2011
Hawk	complete	4851	yes	Lies within bounds of Site 4851, which includes evidence of traditional Hawaiian occupation as well as human interment; Major and Dye 2006 sensitivity areas.	Leidemann and Cleghorn 1983; Barrera 1984; Hammatt and Shideler 1989; Erkelens 2000; Major and Dye 2006; Walker and Morrison 2010; Cochrane 2011; Rasmussen 2008
Owl	complete	4851	yes	Lies within bounds of Site 4851, which includes evidence of traditional Hawaiian occupation as well as human interment; Major and Dye 2006 sensitivity areas.	Leidemann and Cleghorn 1983; Barrera 1984; Athens 1988a, 1988b; Hammatt and Shideler 1989; Dye 1998; Erkelens 2000; Puette and McElroy 2004; Major and Dye 2006; Walker and Morrison 2010; Cochrane 2011; Rasmussen 2008
Tiger	complete	none	no	Heavily graded area; evaluation based on analysis of previous research that found no subsurface deposits; Major and Dye 2006 sensitivity areas.	Hammatt and Shideler 1989; Peterson et al. 2004; Major and Dye 2006; Walker and Morrison 2010; Cochrane 2011; Rasmussen 2008

Archaeological Resources

Most of the archaeological resources at MCTAB are buried cultural deposits that extend as discontinuous units across the Waimanalo coastal plain. As noted by Tuggle (1997:23), the entire MCTAB/BAFS area "may have been a single site prior to World War II construction, that is, there probably was a continuous cultural deposit;" present day sites are "local identifications of this deposit." Most of these sites are characterized by a relatively thin occupational stratum containing midden, charcoal, pit features, artifacts, and human remains. Concentrations of lithic materials in the deposits indicate basalt workshops, primarily at locations away from the coast and along Puha Stream.

The discontinuous character of the occupational deposit is the result of war era construction, during which large portions of the plain were graded and filled. The natural contours of the coastal plain were defined by parallel dunes oriented perpendicular to the coastline and extending about 1,640 ft (500 m) inland. Military construction sheared off high areas and filled low areas of the undulating dune terrain (see description of beach ridges in Desilets and Dye 2002:33-34). Thus, the cultural deposits that remain vary from being close to the present surface to being buried under over 59 in (150 cm) of fill. The construction also likely resulted in redeposition of disturbed remains in secondary contexts.

Surface archaeological sites are limited to plantation era and military structures. Plantation sites are located on the Waimanalo Plain away from the coast. Two sites in the north portion of MCTAB are related to plantation infrastructure, including Site 3309 in the APE of LZ Gull. One site is a turn-of-the-century cemetery used by Japanese and Okinawan plantation laborers (Site 3312; Leidemann and Cleghorn 11983:24); it is located west of Building 700 (west of the north end of LZ Hawk). Military remains include the World War II runways, standing structures, concrete foundations and slabs, earthen berms, and artifact scatters (Tuggle 1997:128-130).

Table 4-41 lists two known archaeological sites eligible for the NRHP that fall within the APEs of the landing zones.

Site 50-80-15-3309. Site 3309 is a complex of surface features related to Waimanalo Sugar Plantation, covering an area of about 4.45 ac (1.8 ha). The site is located at the northwest edge of the LZ Gull APE. Tuggle (1997:127) recommends the site as significant and eligible for listing in the NRHP, based on Criterion D, specifically because it "contains potential information related to early sugar cultivation in Waimanalo."

Table 4-41. NRHP-Eligible Archaeological Sites within the APEs at MCTAB

Site No. *	Description	NRHP Signif **	LZ/DZ	References
3309	Complex of late 19th-early 20th century sugar-related features, including water catchment basin, irrigation channels, and plow furrows	D	Gull	Hurlbett and Haun 1987; Tuggle 1997; Cochrane 2011
4851	Subsurface pre-Contact cultural deposit	D	Owl Hawk	Leidemann and Cleghorn 1983; Barrera 1984; Athens 1988; Hammatt and Shideler 1989; Tuggle 1997; Dye 1998; Erkelens 2000; Puette and McElroy 2004; Major and Dye 2006; Walker and Morrison 2010; Cochrane 2011

* State of Hawaii site number, with prefix "50-80-15-" (50=State of Hawaii, 80=island of Oahu, 15=USGS Waimanalo topographic quadrangle).

Site 50-80-15-4851. Site 4851 is a large area of multiple, discontinuous deposits of pre-Contact and post-Contact materials. Covering the area within and adjacent to LZs Hawk and Owl, the site has been evaluated to be significant and eligible for listing in the NRHP, based on Criterion D. It is included in the NRHP multiple property nomination form for the Waimanalo Archaeological District (Nickelson and Jackson 2007).

The pre-Contact cultural occupation is represented by hearths, postholes, firepits, trash pits, basalt artifacts and flaking areas, volcanic glass, and faunal remains (fish and bird bone, marine shell, pig bone) in a single, discrete stratigraphic unit—near the surface in some locations and occurring at depths of over 5 ft (1.5 m) below the surface in other locations (Tuggle 1997:90-102). Deposits have been disturbed by modern activities, particularly World War II era construction of the southern runway complex (Tuggle 1997; Dye 1998). Occupation at Site 4851 occurred between AD 1160 and 1429 (Dye and Pantaleo 2010:117).

At least 15 intact burials have been found within Site 4851, notably four interments at the south edge of LZ Hawk (Barrera 1984:13). In all cases, the upper boundaries of the interment pits had been truncated by runway construction in the 1940s, leaving only lower portions of the pits and the burials intact. The tops of the remnant pits are covered by 31 to 47 in (80 to 125 cm) of coral construction fill (Barrera 1984:15-20). Critical to the evaluation of the LZs is the discovery of two sets of remains during excavation of a communications line trench north of Building 700. The remains were exposed at 33 to 35 in (85 to 90 cm) below surface under the pavement of the runway apron (Major and Dye 2006:47-48).

Post-Contact materials, including bottle glass, metal, nails, and ceramic fragments, have also been found at Site 4851. Land records indicate that the area was densely populated during the historical period, with multiple LCA parcels and early 20th century farm lots within the boundaries of the site (Dye 1998; Tuggle 1997).

Tuggle (1997:90-102) summarizes the archaeological history of Site 4851 and divides the site into 13 locales based on concentrations of cultural materials. LZ Hawk includes Locales 12 and 13, which are located on the west and east sides of the runway, respectively; in addition to the traditional Hawaiian cultural material, scattered historic debris (bullet casings, glass/ceramic fragments) was also found on the east side of the runway (Leidemann and Cleghorn (1983:11).

LZ Owl includes Locales 2 and 4. Locale 4 is an area of about 361 by 722 ft (110 by 220 m) (Tuggle 1997:93-94). In this area, Leidemann and Cleghorn (1983:14-16) found intact cultural deposits containing fire-cracked rock, charcoal flecks, midden, and artifacts (including lithic materials, adze preforms, a bird bone pick, coconut grater, coral abraders, and a drilled cowrie shell fragment), as well as fragments of human bone representing at least eight individual. The intact deposits were from 10 to 12 in (25 to 30 cm) below surface, but because of extensive disturbance in the area, the depth of the burials below the original surface could not be determined. Cochrane (2011a:59) found a disturbed sand layer containing charcoal flecks, as well as coral pebbles, cobbles, and boulders under 20 in (50 cm) of fill at the north edge of Runway 3R-21L (Trench 4).

At the northeast end of the LZ Owl APE is Locale 2 (Tuggle 1997:91), a cultural deposit exposed in a 3.3 by 3.3-ft (1 by 1-m) test unit (Trench 3) that was cut through the north end of Runway 3R-21L (Hammatt and Shideler 1989). Cochrane (2011a:71, Figure 9) excavated two trenches (Trenches 36 and 37) to the northeast of Locale 2, along the edges of the runway; 20 in (50 cm) of modern fill overlies an undisturbed sand layer to the base of excavation (at 55 to 59 in [140 to 150 cm] below surface).

Traditional Cultural Resources

There are no identified traditional cultural resources, other than burials, in the APEs at MCTAB. However, Site 0383, the hill of Haununaniho, is located on the high ground south of DZ Tiger (south of Tinker Road). This hill is said to be the location of a puuhonua (traditional place of refuge) and as such, "would have been an extremely important location in pre-contact

Hawaii" (Tuggle 1997:88). McAllister (1933:13, 191-192) obtained information on the place from an informant. Another informant, interviewed by Sterling and Summers (1978:245), provided a variation on the name (Hu-nana-niho) was obtained from another informant (Sterling and Summers 1978:245). Tuggle (1997:88) notes that there are no known traditional references to the puuhonua.

4.9.2.2 Army Training Areas on the Island of Oahu

Kahuku Training Area (KTA)

Areas of Potential Effect

The proposed action would include aviation training at three landing zones (LZs Kahuku Range, Kahuku Split Rock, X-Strip) and one drop zone (DZ Kanes) at KTA. The landing and drop zones are presently leveled and cleared, ridge-top locations. No construction is proposed at KTA.

The APE for the landing and drop zones is defined by GPS-located perimeter points plus a buffer area of 350 ft (107 m) extending from the boundary of the defined area. The buffer zone is intended to accommodate rotor downwash from the MV-22.

Historic Context

KTA occupies the inland mountainous regions of 14 ahupuaa at the northern end of the traditional Hawaiian district of Koolauloa. The KTA area has been occupied at least seasonally since the AD 14th century (Williams and Patolo 1998b:67; Drolet et al. 2000:19), although earlier settlement probably occurred along the coast. The coastal plains and valley floors, particularly on the windward side, were developed in irrigated taro pondfields; the western ahupuaa were less intensively developed (Anderson 1997:5-4 to 5-8). The mountain areas were not intensively utilized except for resource collection and possibly for the cultivation and maintenance of trees and shrubs for economic purpose (i.e., arboriculture; see Dega and McGerty 2002a:14-15).

In the early 19th century, northern Oahu, like other areas of the islands, was impacted by the sandalwood trade. The fragrant wood of the native sandalwood tree was highly prized in Asia, particularly China, for making ceremonial and religious items and for its extracted oil that was used in medicines, perfumes, and cosmetics. Kahekili Keeaumoku, chief of the neighboring Waialua District, was one of the more active sandalwood participants (Sahlins 1992:85-86), and Waialua Bay at the midpoint of the north shore was the main collection point for the region (Anderson 1997b:5-15).

After the collapse of the sandalwood trade, activity in the Kahuku uplands in the 1830s appears to have returned to pre-sandalwood uses. The Emersons of the Waialua Mission Station, which included Koolauloa district, reported that taro was "found in abundance in the mountains," and that there was also recently introduced fruit like oranges, lemons, limes, and pineapples, as well as firewood from the upland forests of kukui, koa, mountain apple, and guava (Drolet 2000:7, referencing Emerson 1928).

In the mid-19th century Mahele, the 14 ahupuaa within KTA were divided among the king (called Crown Lands), chiefs, and the government. Two ahupuaa were claimed by the king. Eight ahupuaa were awarded to chiefs, although four were returned to the government in lieu of commutation for taxes owed on other lands. Three ahupuaa were designated Government lands. The disposition of one ahupuaa, Opana, is not known (the land area is not listed in Indices 1929, nor on the www.waihona.com website).

Numerous kuleana claims in the 14 ahupuaa were made by commoners through the Land Commission process. Claims and testimonies indicate that the upland areas were exploited for plants such as hala, noni, pili, koa, kukui, and ti; plants such as wauke and olona were grown or collected to make kapa (paper cloth) or for cordage (Anderson 1997:5-18, Appendix A).

Beginning at mid-century, cattle and sheep ranching took place on much of the northern Koolauloa lands. Malaekahana Ranch was formed in 1850; Kahuku Ranch was established in 1852 (Anderson 1997b:5-19). In 1876, both ranches were consolidated under the ownership of James Campbell, a sugar planter from Maui who acquired extensive holdings on Oahu; the purchase included all of the northern Koolauloa ahupuaa from Malaekahana on the east to Pupukea/Paumalu on the west.

In 1890, Campbell and two partners (James Castle and Benjamin F. Dillingham[35]) formed the Kahuku Plantation Company. The plantation replaced most of the pasture lands with sugarcane; the first crop of sugarcane was harvested in 1892. About 1916, small-scale pineapple cultivation was started on plantation lands, including some of the lower reaches of the Koolau uplands (Anderson 1997b:5-21).

[35] Dillingham had just completed the first leg of his Oahu Railway and Land Company (OR&L) line between Honolulu and Pearl Harbor, with plans to extend further west and to the north shore (see discussion under Dillingham Military Reservation).

In the mid-1920s, the Kahuku Forest Reserve was established by the territorial government. At around the same time, the U.S. Army constructed the Kahuku-Pupukea Trail for military training, in spite of government foresters' concerns about the possible introduction of aggressive alien plants into the forest reserve (Ball 2001).

Between 1934 and 1936, the Civilian Conservation Corps (CCC) under the supervision of the Army Corps of Engineers constructed Drum Road to connect existing military bases, training areas, and areas on Oahu that would have to be defended by the Army (Cox and Lucking 2004). Drum Road was intended to provide direct access between central Oahu and the north shore of the island, with minimum use of public roads and highways.

During World War II, Army activity focused on the coast, with the construction and use of Kahuku Airfield. The airfield was deactivated at the end of World War II and the land returned to private hands. In 1956, Kahuku Plantation leased 280 inland acres (113 ha) to the U.S. government for military training (Anderson 1997b:5-21). Additional leases eventually increased KTA to its present size of more than 9,600 ac (3,885 ha).

Archaeological and Cultural Surveys

Table 4-42 lists the previous archaeological and cultural investigations in and near the APEs of the four landing/drop zones. All of LZ Kahuku Range (Eastwood 2010) and DZ Kanes (L. Gilda, pers. comm.) have been surveyed. The northern edge of LZ X-Strip (Drolet 2000) (Buffum et al. 2004; Whitehead et al. 2005) has been surveyed.

Table 4-42. Previous Archaeological Investigations in and near APEs at Kahuku Training Area

Author	Date	Description of Work	Location Relative to APEs	Findings Pertinent to LZs
Rosendahl	1977	reconnaissance survey	Keaaula Gulch west of LZ Split Rock; Oio Gulch east of DZ Kanes	Sample survey of 1,044 acres; west portion of LZ Split Rock APE drops into Keaaula gulch, Site 9506 (historic ditch) in gulch approximately 350 ft north of LZ APE; no sites w/in APEs
Davis	1981	reconnaissance survey	general	Surveyed specific locations of proposed wind turbine sites; no sites w/in APEs
Williams and Patolo	1998	reconnaissance survey	East of LZ Kahuku Range	Sample survey of 740 acres; no survey in APEs; proposed areas of site probability for KTA; no sites w/in APEs
Drolet	2000	inventory survey	LZ X-Strip	Surveyed 410.4 acres between and in Pahipahialua and Waialee Gulches, including north edge of LZ X-Strip; no sites in APE

Table 4-42. Previous Archaeological Investigations in and near APEs at Kahuku Training Area

Author	Date	Description of Work	Location Relative to APEs	Findings Pertinent to LZs
Zulick and Cox	2002	reconnaissance survey	North of LZ X-Strip	Survey for site improvements at Primary Assembly Area 1 (PAA 1); roughly same area as O'Rourke 2004; no sites w/in APE
Buffum et al.	2004	survey	East of LZ Kahuku Range	Survey, testing of 650 acre of Combined Arms Collective Training Facility (CACTF) and Tactical Vehicle Wash (TVW); no sites w/in APE
O'Rourke	2004	inventory survey	North of LZ X-Strip	Surveyed 9.5 acres on ridge between Pahipahilua and Waialee Gulches; within 500 m of LZ X-Strip; no sites w/in APE
McGerty and Spear	2004	cultural study	general	Assessment of potential traditional cultural places; report not available for review
Margotta	2009	Section 106 compliance	immediately north of DZ Kanes	Compliance survey for improvements at 18 helipad locations; Pinocchio landing pad just north of DZ Kanes; no sites in APE; other landing pads are not near other LZs
Eastwood	2010	Section 106 compliance	LZ Kahuku Range	Compliance survey for rehabilitation of Old Kahuku Range Control LZ; surveyed entire area of LZ, as well as foot trails extending north and south of LZ; no sites in APE

Table 4-43 summarizes the cultural resources characteristics of the APEs at KTA, based on findings of the surveys described above.

Table 4-43. Cultural Resources Characteristics of the APEs at Kahuku Training Area

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites**	Basis for Probability Evaluation	References
Kahuku Range	Complete	none	no/yes	Completed Section 106 review	Davis 1981; Buffum et al. 2004; Desilets 2004; Zulick 2005; Eastwood 2010
Kahuku Split Rock	partial	none	yes/yes	Army CR evaluation; probability high outside of disturbed LZ area	Rosendahl 1977; Davis 1981; surveyed by Scientific Consultant Services survey (report pending)

Table 4-43. Cultural Resources Characteristics of the APEs at Kahuku Training Area

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites**	Basis for Probability Evaluation	References
Kanes	complete	none	no/yes	Army CR evaluation	Chapman 1970; Rosendahl 1977; Davis 1981; Margotta 2009; surveyed by Scientific Consultant Services (report pending)
X Strip	partial	none	yes/yes	Army CR evaluation; falls within area identified as "sensitive" on Army cultural resources GIS	Davis 1981; Drolet 2000; Zulick and Cox 2002; O'Rourke 2004

* Surface survey only.

** The first part of the probability assessment refers to potential for surface sites; the second part refers to potential for subsurface deposits.

Archaeological Resources

The surveys described above did not record any NRHP-eligible archaeological sites within the APEs of the KTA landing/drop zones. There is a potential to encounter archaeological resources, including subsurface features at all four LZs and both surface and subsurface features at LZs Kahuku Split Rock and X-Strip.

Traditional Cultural Resources

There are no identified traditional cultural resources within the APEs of the KTA landing/drop zones.

Kawailoa Training Area (KLOA)

Areas of Potential Effect

Aviation training is proposed at six KLOA landing zones (LZs Red, Elephant's Foot, Nixon, Black, Puu Kapu, Non-Stop). No construction is proposed at KLOA. The landing zones are ridge top locations that have been leveled and cleared of vegetation.

The APE for the landing zones is defined by GPS-located perimeter points plus a buffer area of 350 ft (107 m) extending from the boundary of the defined area. The buffer zone is intended to accommodate potential impacts from MV-22 rotor downwash.

Historic Context

KLOA falls within Paalaa and Kawailoa ahupuaa in the traditional Hawaiian district of Waialua, and in Waimea ahupuaa in Koolauloa district. Also within the boundaries of KLOA is Helemano, which is sometimes termed an ahupuaa of Waialua, or alternatively may have been a subdivision (ili) of Paalaa (Donn 1902).

Traditional Hawaiian settlement in the Waialua district focused on the coastal plain on the north shore of Oahu and extended up the long river valleys, particularly Waimea Stream, Anahulu-Opaeula Stream, and the Helemano-Poamoho-Kaukonahua Stream complex. The upland areas, such as that encompassed by KLOA, were not places of intensive occupation. However, they were likely important collection areas for resources like timber, medicinal plants, and birds (for food and feathers). Dega and McGerty (2002a:14-15) suggest that trees and shrubs were also cultivated or maintained for economic purposes, with use in the area occurring possibly as early as the AD 15th century.

In the early post-Contact period, the inland region of Waialua saw more intensive use as a result of Kamehameha’s conquest of Oahu and the subsequent redistribution of lands to his supporters and warriors (Sahlins 1992:52). Interior areas were brought under cultivation, with irrigated terraced fields for taro constructed on river flats as far as seven mi (11 km) inland (Kirch 1992).

Another early 19th century change that affected the inland region was the commercialization of resource collection, specifically related to fragrant sandalwood. The chief of Waialua District, Kahekili Keeaumoku, was one of the more active sandalwood participants (Sahlins 1992:85-86), and Waialua Bay was the main collection point on the north shore. Numerous entries in the journal of Honolulu merchant Stephen Reynolds (King 1989), who was active in the sandalwood trade, refer to the heavy traffic of schooners and brigs at Waialua, particularly between 1824 and 1829 (Anderson 1997b:5-15, brackets added). As the sandalwood began to dwindle and the forests retract, collectors took to burning the landscape to find the sandalwood from its distinctive scent (Bishop 1916:45), with devastating outcome to the natural environment.

In the mid-19th century Mahele, the three ahupuaa in which KLOA falls were awarded to Victoria Kamamalu. She subsequently relinquished all of the lands to the government in commutation for payment of fees for other lands (Barrere 1994:223). Commoners claimed lands in the ahupuaa but most are concentrated near the coast. Six LCAs fall within or immediately adjacent to KLOA in upper Anahulu Valley. The parcels are generally on alluvial flats and on slightly higher elevations along Kawainui Stream. The claims and testimonies describe watercourses and land on which orange trees, sweet potato, and taro were cultivated (Dega and McGerty 2002a:25-26).

In the mid- to late-1800s, commercial agriculture (primarily sugar), cattle grazing, and small-scale farming transformed much of the non-coastal lands of north-central Oahu. The impact of this massive land transformation touched only slightly on the rugged and remote KLOA lands. Robinson and Company owned over 12,000 ac (4,856 ha) of inland Paalaa by 1852, and evidence of ranching operations includes several historic cattle pens and cattle trails along Pupukea Road (Dega and McGerty 2002a:25). Another historic period impact was the development of sugar-related irrigation networks that tapped permanent streams in the upper Koolau Mountains (Dega and McGerty 2002b:148).

KLOA was established in the 1930s as one of many Army military training areas on the island. Between 1934 and 1936, the CCC constructed Drum Road along the western edge of KLOA (Cox and Lucking 2004). Part of an extensive Army strategic and tactical program to ensure military access between and among existing bases, training areas, and areas that would have to be defended, Drum Road was intended to provide direct access to the north shore of the island, including KTA. During World War II, the 47th Engineer Regiment built several bridges along Drum Road to provide better military access to the Kahuku area (McDonnell 2005).

In addition to Drum Road, the military built defensive features in KLOA in the late 1930s and early 1940s. These included two two-story high concrete towers to hold Panama Mounts for 155 mm guns; each battery was provided with a splinter proof magazine and a battery commander's station (Paliwoda 1990:36). Additional gun mounts, including 240 mm guns, were also built in the lower reaches of Kawailoa and Waimea.

During this same period, at the instigation of the territorial forestry department, the CCC began a program of trail construction in the Koolau Range (Ball 2002a). By the end of the first six months of the program, CCC workers based at Schofield Barracks built the Kawailoa and Poamoho Trails, nearly reaching the existing Koolau Summit Trail. The trails built by the CCC were used in 1942 when the Army and Navy staged a mock invasion of Oahu, and the Army continued to use the trails for training (Ball 2002b).

Due to its very rugged terrain, KLOA has been used for small infantry unit maneuvers for mountain and jungle warfare training, as well as for aviation training for rotary wing aircraft.

Archaeological and Cultural Surveys

Table 4-44 lists the archaeological investigations in and near the KLOA landing zones. Specific to the present EIS evaluation are the inventory surveys carried out by Dega and McGerty (2002a, 2002b), which covered 27 sample areas, several of which are on ridge tops like the LZ locations. Ridge top areas include all or portions of LZs Non-Stop and Puu Kapu. Two valley sample areas (Kamananui Stream and an unnamed tributary of Elehaha Stream) are west of LZs Elephant's Foot and Nixon, respectively. Projects carried out in proximity to the landing zones are included because they provide a context for assessing possible impacts on sites within the APEs.

A formal survey of traditional cultural properties has been undertaken for KLOA (McGerty and Spear 2004), but this report was not available for review.

Table 4-44. Previous Archaeological Investigations in and near APEs at Kawailoa Training Area

Author	Date	Description of Work	APE	Findings Pertinent to LZs
Rosendahl	1977	reconnaissance survey	none	Survey of almost 524 acres; five sites identified, all near junction of Kawainui and Kawaiiki Streams (south of LZ Puu Kapu)
Kirch	1992	survey and excavation	none	Research in middle Kawailoa Stream; six sites within KLOA, all near junction of Kawainui and Kawaiiki Streams (south of LZ Puu Kapu)
Sahlins	1992	archival, ethnohistoric research	general	General historic context for land use and settlement in Kawailoa ahupuaa
Dega and McGerty	2002a	Phase I survey	LZ Non-Stop LZ Puu Kapu LZ Black	Sample survey of13 areas of about 604 acres selected for survey; 34 sites found; Site 5636 in LZ Puu Kapu
Dega and McGerty	2002b	Phase II survey	none	Sample survey of16 areas; focus on valley floors, except for survey along Poamoho and Koolau Summit Trails;14 sites found, test excavations in four sites
Cox and Lucking	2004	reconnaissance survey	none	Follow-up survey to Whitehead et al. 2005 by USAG-HI* CR staff
McGerty and Spear	2004	cultural study	general	Assessment of potential traditional cultural places; report not available for review.

Table 4-44. Previous Archaeological Investigations in and near APEs at Kawailoa Training Area

Author	Date	Description of Work	APE	Findings Pertinent to LZs
Whitehead et al.	2005	inventory survey	LZ Puu Kapu	Survey of 15-m corridor to either side of Drum Road; no sites w/in APE, but Site 6442 is just south of LZ Puu Kapu
McDonnell	2005	reconnaissance survey	LZ Puu Kapu	Follow-up survey to Whitehead et al. 2005 by USAG-HI* CR staff; road segment in southwest portion of LZ Puu Kapu; no sites w/in APE
Kaschko and Dega	2005	data recovery	LZ Puu Kapu	Excavation of Site 5636 firepit feature (see Dega and McGerty 2002a)

Table 4-45 summarizes the cultural resources characteristics of the APEs at KLOA, based on findings of the surveys described above.

Archaeological Resources

Dega and McGerty (2002a, 2002b) summarize the KLOA site inventory, which consists primarily of traditional Hawaiian wetland and dryland agricultural features, temporary and permanent habitation sites, burial loci, trails, and possible ceremonial structures. The majority of sites are located on lower valley flats and at the base of taluvial slopes. Dega and McGerty (2002a: abstract) assert that site distribution in this rugged mountain landscape is "directly correlated with topography, and by extension, access and geomorphic characteristics, these being steep valley slopes and/or ridges."

Only one site has been identified within the APE of a KLOA landing zone—LZ Puu Kapu.

Table 4-45. Cultural Resources Characteristics of the APEs at Kawailoa Training Area

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites**	Basis for Probability Evaluation	References
Black	partial	none	yes/yes	Army CR evaluation; falls within area identified as "sensitive" (Anahulu complex) on Army cultural resources GIS.	Dega and McGerty 2002b
Elephants Foot	none	unknown	yes/yes	Army CR evaluation; probability based on lack of survey.	None

Table 4-45. Cultural Resources Characteristics of the APEs at Kawailoa Training Area

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites**	Basis for Probability Evaluation	References
Nixon	none	unknown	yes/yes	Army CR evaluation; probability based on lack of survey.	None
Non Stop	partial	none	yes/yes	Army CR evaluation; probability based on lack of survey.	Dega and McGerty 2002a
Puu Kapu	complete	5636	no/yes	Army CR evaluation	Dega and McGerty 2002a, 2002b; Whitehead et al. 2005; Kaschko and Dega 2005; McDonnell 2005
Red	none	none	yes/yes	Army CR evaluation; probability based on lack of survey	None

* Surface survey only.

** The first part of the probability assessment refers to potential for surface sites; the second part refers to potential for subsurface deposits.

Site 50-80-05-5636. Site 5636 is a large firepit remnant exposed in the road surface at LZ Puu Kapu. At the time of its discovery, this circular charcoal concentration measured 4.3 ft (1.3 m) in diameter and extended at least 4 in (10 cm) below surface (Dega and McGerty 2002a:109-110). Site 5636 was evaluated to be significant under NRHP Criterion D (Dega and McGerty 2002a: Table 6). The firepit feature was subsequently excavated (Kaschko and Dega 2005); no additional work is recommended.

In addition to Site 5636, there is a potential to encounter other archaeological sites at the KLOA LZs—in particular, subsurface features at all six LZs, and surface and subsurface features at LZs Elephant's Foot, Nixon, and Red.

Traditional Cultural Resources

There are no identified traditional cultural resources in the APEs at KLOA.

Schofield Barracks East Range (SBER)

Areas of Potential Effect

The proposed action includes aviation training at six existing landing zones and one drop zone at SBER. DZ Lightning and LZs Lower 36 and Upper 36 areas are overlapping on a broad, level area south of the upper Wahiawa community. LZs Lower 72, Upper 72, and Italy are situated in a cluster on a smaller ridge to the southeast. LZ Ku Tree is on a small ridge between the two clusters of landing zones. No construction is proposed at SBER.

The APE for the landing and drop zones is defined by GPS-located perimeter points plus a buffer area of 350 ft (107 m) extending from the boundary of the defined area. This buffer is intended to accommodate potential impacts of MV-22 rotor downwash. All of the APEs are presently leveled and cleared ridge-top areas.

Historic Context

SBER falls in the eastern portion of the ahupuaa of Waianae Uka, in the traditional Hawaiian leeward district of Waianae. This ahupuaa encompasses the central Oahu plateau, from the crest of the Waianae Mountains to the crest of the Koolau Range. It is linked across Kolekole Pass to the leeward ahupuaa of Waianae Kai.

Settlement and land use on the central Oahu plateau may have occurred as early as the AD 14th century, with temporary or seasonal occupation combined with agricultural practices (Carson and Yeomans 2000:81; Robins and Spear 1997a, 1997b). Permanent occupation and more intensive agricultural development occurred subsequent to AD 1650.

Trails across central Oahu linked the north and south shores of the island and connected the central uplands with the leeward coast. Kolekole Pass across the Waianae Range was a major transportation corridor and is referenced in traditions related to ancient battles. (For example, in the mid- to late-AD 1600s, the Oahu ruling chief Kualii mounted his forces against the warriors of rebellious Ewa and Waialua chiefs, and they met on the "land of Kalena and the plain of Heleauau" on the Oahu saddle; see Fornander 1969:II-281). Along with the north-south Waialua Trail, the Kolekole Trail is described in a 19th century account of traditional trails on Oahu (Ii 1963:99). In the latter description, there were large populations on the central plateau and specifically a village at the junction of the Waialua and Kolekole Trails.

In the early post-Contact period, the beginnings of foreign commerce, in the form of sandalwood and firewood collection, interrupted the traditional cycle of settlement and land use. Kamakau (1961:207) writes that, in 1816, "the largest trees were at Wahiawa." Firewood was another commodity during this period; it was aggressively collected, particularly to supply whaling ships with fuel to render whale blubber into oil (Tomonari-Tuggle and Bouthillier 1994:18).

During the mid-century Mahele, Waianae Uka was claimed by the king as Crown Lands. There were no commoners' claims for land.

In the second half of the 19th century, the central plateau of Oahu was part of an extensive cattle ranch, run at various times by John Meek, James I. Dowsett, George Galbraith, and a partnership of King Kalakaua and Charles Judd (Tomonari-Tuggle and Bouthillier 1994:19-24). In 1889, when Dowsett purchased the central Oahu ranch, it covered 20,000 ac (8,094 ha), with 3,000 head of cattle and other stock.

The extent of ranch activity into the area of SBER is not clear, but a 1906 government map of Oahu (Donn 1902, with notations dated 1906) shows the far eastern mountainous portion of Waianae Uka as forest reserve and the area immediately to the west as grazing. Just north of this grazing area was the Wahiawa Colony, an area settled by homesteaders who found a profitable agrarian pursuit in pineapple. In 1900, James B. Dole joined the Wahiawa Colony and began growing pineapple for a canning operation (Nedbalek 1984:25). Supported by the 1906 completion of the Oahu Rail & Land Company line from Waipahu, pineapple production expanded across thousands of acres of central Oahu.

After the 1893 overthrow of the Hawaiian monarchy, the ahupuaa of Waianae Uka, as Crown Lands, reverted to the public domain. Within a year after Hawaii was annexed by the United States in 1898, Waianae Uka was set aside as a U.S. military reservation (Alvarez 1982:18). In 1908, it was selected as the base for Oahu's mobile defense troops because of its strategic central location on the island (Tomonari-Tuggle and Bouthillier 1994:25). Construction on the permanent base, which became Schofield Barracks, began in 1909. By 1914, there were 6,000 men stationed at the installation (Alvarez 1982:27).

The SBER role in the early years of Schofield Barracks may have been limited to its water resources; a collection system tapping the Koolau watershed was constructed to provide a consistent water supply to the post (Robins and Spear 2002b:33). Canon Dam was built in upper Kaukonahua Stream, and tunnels and flumes brought water to reservoirs close to the installation. In 1925, Ku Tree Reservoir and a connecting tunnel-flume system were constructed in a stream valley tributary of Kaukonahua Stream (Alvarez 1982:50). The water situation, however, remained tentative, with shortages resulting from dry summers and periodic droughts. In the early 1950s, a 600-ft (183-m) deep well was drilled at Schofield and likely resulted in the abandonment of the Koolau dams and reservoirs (Robins and Spear 2002b:35).

Archaeological and Cultural Surveys

Archaeological investigations at SBER have included an inventory survey of a sample of areas (Robins and Spear 2002a, 2002b), as well as a survey by Army cultural resources staff of the southern cluster of LZs for Section 106 compliance (Margotta 2010). As a result of these surveys, all LZs have been examined for the presence of archaeological sites. The Robins and Spear (2002a, 2002b) sample, specifically Survey Areas SA-2, SA-5, and SA-6, includes all or portions of LZs Lower 36, Upper 36, Ku Tree and DZ Lightning. The Section 106 compliance survey (Margotta 2010) was carried out in anticipation of rehabilitation and reconfiguration of LZs Upper 72, Lower 72, and Italy to form a combined operations area. No archaeological sites are identified in the APEs of the landing/drop zones.

As part of the EIS prepared for permanent stationing of the U.S. Army Stryker Brigade, an oral history study to locate traditional cultural properties (also called areas of traditional interest, ATIs, in the EIS) was completed (Army HQ 2008). Informants indicated that “there were several ATIs in the area, but they would not disclose specific information about their locations” (Army HQ 2008:3-36). The presence of cultural places is consistent with traditions that indicate that the central plateau was an area of sacred activities and the residences of Oahu chiefs.

Table 4-46 summarizes the cultural resources characteristics of the APEs at SBER, based on findings of the surveys described above.

Archaeological Resources

Five archaeological sites have been identified at SBER (Robins and Spear 2002a, 2002b), but none are within the landing/drop zone APEs. The closest site to an LZ is Site 50-80-09-5509, the Ku Tree Dam, located between LZ Ku Tree and the southeastern cluster of LZs. The boundaries of the reservoir as shown in the 1936 USGS Wahiawa topographic map touch the edges of the APEs of both LZs. Since its abandonment in the late 1960s, the reservoir is “considered to have reverted to its pre-reservoir condition of a network of streams” (Army HQ 2008:3-60). The site is reported eligible for listing in the NRHP, based on significance Criterion D (Robins and Spear 2002b:123).

Table 4-46. Cultural Resources Characteristics of the APEs at Schofield Barracks East Range

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites**	Basis for Probability Evaluation	References
Italy	complete	none	no/yes	Army CR evaluation	Margotta 2010
Ku Tree	complete	none	no/yes	Army CR evaluation	Robins and Spear 2002a, 2002b
Lightning	complete	none	no/yes	Army CR evaluation	Robins and Spear 2002a, 2002b
Lower 36	complete	none	no/yes	Army CR evaluation	Robins and Spear 2002a, 2002b
Lower 72	complete	none	no/yes	Army CR evaluation	Margotta 2010
Upper 36	partial	none	no/yes	Army CR evaluation	Robins and Spear 2002a, 2002b

* Surface survey only.
** The first part of the probability assessment refers to potential for surface sites; the second part refers to potential for subsurface deposits.

Based on an analysis of previous archaeological investigations, Anderson (1998:3-39) evaluates SBER as having low probability for archaeological sites: "Much of East Range has been impacted by ground disturbing activities, and erosion. The non-impacted areas yielded very few archaeological sites." This evaluation is reiterated by Robins and Spear (2002b:123) in one of the more recent archaeological studies of the area.

Traditional Cultural Resources

No traditional cultural resources are documented within the APEs of the landing/drop zones proposed for use at SBER.

Dillingham Military Reservation (DMR)

Areas of Potential Effect

The proposed action includes aviation training at the DMR airfield and five landing zones (LZs Dillingham, Albatross, Blue Jay, Finch, and Rooster). The LZs are on abandoned runways and taxiways. No construction is proposed at DMR.

The APE for the LZs is defined by GPS-located perimeter points plus a buffer of 350 ft (107 m) extending from the boundary of the defined area. The APE for Dillingham Airfield is the runway plus an approximate 100-ft (30-m) buffer around the runway, which encompasses the paved parking apron. The buffers are intended to accommodate potential impacts from MV-22 rotor downwash.

Historic Context

DMR is located primarily within the three ahupuaa of Kaena, Kealia, and Kawaihapai at the western end of the traditional district of Waialua. A small portion of the east end of the runway falls in Mokuleia ahupuaa.

The DMR landing zones are situated on the narrow coastal plain at the base of the northern Waianae Range. There are no permanent water sources on the flat land, but the slopes behind DMR are cut by several streams that drain steep, narrow gulches. Although presently dry, these streams may have at one time carried water across the plain to the sea. Elevated springs are found on the lower cliffs of the range.

Archaeological studies suggest that traditional Hawaiian settlement of this area began during the period between AD 1400 and 1600 (McGerty and Spear 2009:19-20, 59, 109-110). People lived primarily along the shoreline and cultivated the level plain between the cliff and coast. They also used the swales in the slopes at the foot of the Waianae Mountains, as indicated by gardens of terraced irrigated and dryland terraces, irrigation canal, walls, platforms, and modified outcrops (Sites 0416, 5483 to 5486, and 5491, in McGerty and Spear 2001, 2009). Kawailoa Heiau (Site 0191), located at the east end of this clustering of agricultural sites, may have been a small agricultural temple.

At the coast, habitation focused at the mouths of streams (Moblo 1991). From there, fishermen accessed the rich resources of the near-shore and deep waters. They also cultivated fish in constructed or maintained ponds (see claim and testimony for LCA 0873). The sand dunes were a place for burying the dead.

In the mid-19th century Mahele, all four ahupuaa that presently encompass DMR were awarded to Victoria Kamamalu, but she subsequently relinquished all of the lands to the government in commutation for payment of fees for other lands (Barrere 1994:223). A number of commoners claimed kuleana as part of the Land Commission process, but most were not awarded (www.waihona.com). Alameida (2003:42, referencing a May 1850 letter written by Waialua missionary and government land agent John S. Emerson) writes that they were “usually small tracts of wet land taro, kula lands for dry crops and pasture or a house lot.”

By the late 1800s, the DMR area was under cultivation of sugarcane and newly introduced crops like wheat, corn, rice, and coffee (Emerson 1928:183). Water from the springs was diverted to feed commercial fields, although taro continued to be grown in scattered, well-watered locations. Cattle and dairy ranching was also taking place.

In 1898, Benjamin Dillingham's Oahu Railway and Land Company (OR&L) rail line on the south shore of the island was extended around Kaena to Haleiwa where Dillingham had a hotel. He also acquired north shore ranch lands, retaining some for cattle and horses and selling the rest to sugarcane interests. In the DMR area, the rail line followed the coast, stopping at two stations, Kawaihapai (near the midpoint of the airfield) and another just east at Mokuleia. Small settlements grew around the railroad stations (Emerson n.d.).

In 1922, Camp Kawaihapai was established as a communications station (http://hawaii.gov/ hawaiiaviation/ hawaii-airfields-airports/ oahu-pre-world-war-ii/dillingham-field), and five years later, it became Kawaihapai Military Reservation. Prior to World War II, the area continued to be farmed in sugarcane, with some localized rice and taro (Handy 1940:85; Buffum et al. 2004:18).

A small grass and sand runway called Mokuleia Airfield was located west of the military reservation. By the early 1940s, P-40 aircraft deployed at the airfield (http://hawaii.gov/ hawaiiaviation/ hawaii-airfields-airports/ oahu-pre-world-war-ii/ dillingham-field). During the war years, the airfield was expanded into a 9,000-ft (2,743-m) runway, with an additional crosswind runway. The coastal plain was graded and filled for construction of an extensive network of revetments and taxiways.

Military activity at DMR decreased rapidly in the years immediately following the war. In 1948, the newly formed U.S. Air Force took over the field and renamed it Dillingham Air Force Base after Captain Henry Gaylord Dillingham, a B-29 pilot who was killed in action over Kawasaki, Japan (Captain Dillingham was the grandson of the OR&L's Benjamin Dillingham).

In 1961, a Nike-Hercules missile facility (one of four such facilities on Oahu) was established at DMR and remained active until 1970. It was operated by the Hawaii Army National Guard. In 1975, the Air Force base was transferred to the Army, which subsequently leased the airfield to the State of Hawaii for civilian use. DMR is currently used as a joint civilian-military facility.

Archaeological and Cultural Surveys

Most of DMR has been covered by archaeological surveys, most recently by extensive inventory surveys that included surface survey combined with test excavations (McGerty and Spear 2001, 2009; McGerty and O'Rourke 2005). No cultural studies have been carried out at DMR. McGerty and Spear (2001) document a comprehensive study of archaeological resources conducted at DMR in 1996. Sixteen sites, representing traditional Hawaiian and 19th and 20th century periods, were recorded or re-identified. McGerty and O'Rourke (2005) focus on two of the sites (Sites 0191 and 5487) recorded in the 1996 survey. McGerty and Spear (2009) report on the remaining sites, except for two sites determined to be outside the installation boundaries.

Table 4-47 summarizes the modern archaeological work at DMR (i.e., it does not include the general surveys carried out in the early 1900s). In addition to the listed reports, Scientific Consulting Services (SCS) has completed a survey at DMR, for which a final report is pending (L. Gilda, pers. comm.).

Table 4-47. Previous Archaeological Investigations in and near the APEs at Dillingham Military Reservation

Author	Date	Description of Work	Location	Findings Pertinent to LZs
Rosendahl	1977	reconnaissance survey	all	Background research on general traditional land use and settlement in coastal plain of Kawaihapai.
Moblo	1991	literature search, reconnaissance survey	all	Survey of Dillingham Master Plan project area, which includes Dillingham runway; suggests that military development may be surficial and therefore subsurface deposits may remain in developed areas.
McGerty and Spear	2001	inventory survey	all	Surveyed 504 ac (204-ha) parcel; 16 sites; Site 5487 in LZ Albatross
McGerty and O'Rourke	2005	inventory survey	LZ Albatross	Worked specifically on Sites 0191 and 5487; possible buried wetland deposit exposed in excavation at Site 5487; report not available for review.
McGerty and Spear	2009	inventory survey	LZ Albatross LZ Rooster LZ Finch LZ Blue Jay	Mapped, and tested 14 sites; five evaluated to be significant under NRHP Criterion D; Sites 5479, 5482, 5488, 5490 w/in APEs.

Table 4-48 summarizes the cultural resources characteristics of the APEs at DMR, based on findings of the surveys described above.

Archaeological Resources

The archaeological resources of DMR fall into three categories: traditional Hawaiian sites, historic period plantation or ranching sites, and military sites.

Table 4-48. Cultural Resources Characteristics of the APEs at Dillingham Military Reservation

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites **	Basis for Probability Evaluation	References
Albatross	complete	5487 revetments 5490	yes/yes	Army CR evaluation	Moblo 1991; McGerty and Spear 2001; McGerty and O'Rourke 2005; SCS report pending***
Blue Jay	complete	5482 revetments 5490	yes/yes	Army CR evaluation	Moblo 1991; McGerty and Spear 2001, 2009; SCS report pending
Dillingham	complete	none	yes/yes	Army CR evaluation	Moblo 1991; McGerty and Spear 2001, 2009; SCS report pending
Dillingham Runway	complete	none	yes/yes	Army CR evaluation	Rosendahl 1977; Moblo 1991; McGerty and Spear 2001, 2009; SCS report pending
Finch	complete	none	yes/yes	Army CR evaluation	Moblo 1991; McGerty and Spear 2001, 2009; SCS report pending
Rooster	complete	5479 revetments 5490	yes/yes	Army CR evaluation	Moblo 1991; McGerty and Spear 2001, 2009; SCS report pending

* Surface survey only.

** The first part of the probability assessment refers to potential for surface sites; the second part refers to potential for subsurface deposits.

*** "SCS report pending" refers to documentation of a Phase I and II survey of the installation; the report is not yet available for review.

Traditional Hawaiian sites, including extensive agricultural and habitation features, at least three springs, and a heiau (Site 0191, Kawailoa Heiau), are clustered in the inland portion of the installation along the base of the cliff. At the coast, traditional sites include dune burials (Site 3747 at the east end of the runway) and the former locations of two fishing shrines, Puu o Hekili (Site 0190) and Kuakea (Site 0193), neither of which remains (McAllister 1933:128, 129). A buried wetland soil, possibly the remains of taro cultivation, was exposed in an excavation in Site 5487 on the coastal flat land (McGerty and O'Rourke 2005). The present distribution of remains is the result of historic plantation and modern military development on the coastal plain, which has likely obscured or obliterated archaeological sites on the level land between the base of the cliff and the coast.

Historic period ranching and sugar sites include ranch walls (in Sites 5483, 5485, and 5486), a railroad-related ramp (Site 5480), and a reservoir (Site 5482) at the southern edge of the installation. Water control features in Site 5482 are scattered in the southern portion of the developed area.

Military sites consist of revetments, concrete foundations, and magazines dating from World War II and the Cold War; Site 5488 within LZ Finch consists of buildings and structures related to the Nike-Hercules missile launch complex. The U.S. Army is presently documenting and evaluating the network of World War II era revetments as a site complex (L. Gilda, pers. comm.).

All of the sites at DMR are reported eligible for listing in the NRHP, primarily under significance Criterion D. Site 0191, Kawailoa Heiau, is reported eligible under Criteria A and D (McGerty and Spear 2009:123). None of the sites, however, have been formally evaluated, and until eligibility determinations are made, they are being treated as eligible to the NRHP (L. Lucking, pers. comm.). Table 4-49 lists NRHP-eligible archaeological sites that have been identified within the DMR landing zone APEs.

Site 50-80-03-5479. Site 5479 consists of three World War II concrete buildings situated in the southern portion of DMR (McGerty and Spear 2009). They were constructed in 1942. Building 638 was the telephone exchange, Building 657 was an electrical building, and Building 700 was a magazine. Building 700 falls within the APE of LZ Rooster; the other buildings are not within the APEs of the landing/drop zones.

Table 4-49. NRHP-Eligible Archaeological Sites within the APEs at Dillingham Military Reservation

Site No. *	Description	NRHP Signif **	LZ Location	References
5479	Three WWII era concrete buildings	D	Rooster	McGerty and Spear 2001, 2009
5482	Brick, mortar, and concrete water control features and reservoir; probably dating to1920s, 1930s	D	Blue Jay	McGerty and Spear 2001, 2009
5487	WWII era military features; possible buried traditional Hawaiian pondfield deposit	D	Albatross	McGerty and Spear 2001, McGerty and O'Rourke 2005
5490	WWII era storm-water run-off channel	D	Albatross Rooster Blue Jay	McGerty and Spear 2001, 2009
--	WWII revetments	not yet evaluated	Albatross Rooster Blue Jay	USAG-HI cultural resources staff

* State of Hawaii site number, with prefix "50-80-03-" (50=State of Hawaii, 80=island of Oahu, 03=USGS Kaena topographic quadrangle).

** The NRHP significance has not yet been evaluated by the SHPO (see Section 3.9.1 for definitions of significance criteria).

Site 50-80-03-5482. Site 5482 consists of a reservoir and at least seven water control features described as "sub-conical partially elevated manholes" (McGerty and Spear 2009); these are scattered across the south-central and southeastern portions of DMR. One of the manholes is situated within the LZ Blue Jay APE. The reservoir is a (33 by 26-ft) 10 by 8-m rectangular enclosure constructed of similar materials to the manholes; it is located at the southeastern corner of DMR at the base of the mountain slope outside of the DMR APEs.

Site 50-80-03-5487. Site 5487 consists of military features but also includes a possible buried traditional Hawaiian pondfield deposit (in ST-17) (McGerty and Spear 2001; McGerty and O'Rourke 2005). The site falls within the APE of LZ Albatross.

Site 50-80-03-5490. Site 5490 is a World War II era channel, presumably to control storm run-off from flooding facilities on the coastal plain (McGerty and Spear 2009:Figure 3). The channel runs along the inland side of the southern line of revetments and extends to the west through the Site 5487 area. Another channel carried water from a natural drainage in the cliff face into the Site 5490 channel. Sections of the channels fall within the APE of LZs Rooster, Blue Jay, and Albatross.

World War II Revetments. In addition to these sites, a line of small, rectangular World War II era revetments line the southern perimeter of the installation at the base of the talus slope. Another complex of larger, horseshoe-shaped revetments is at the west end of DMR, between the runway and the base of the cliffs west of the taxiway. The U.S. Army is documenting and evaluating the revetments as a historic complex (L. Gilda, A. Exzabe, pers. comm.). There are rectangular revetments in the LZs Rooster and Blue Jay APEs and horseshoe-shaped revetments in the LZ Albatross APE.

Traditional Cultural Resources

There are no identified traditional cultural resources within the APEs of the DMR landing zones. However, it is possible that military development of DMR had only a surficial impact, as suggested by Moblo (1991:13). Buried cultural deposits, including human remains, may underlie modern surface structures, particularly the runway which was built on the coastal dune.

4.9.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

Areas of Potential Effect

The proposed action at Pohakuloa Training Area encompasses two adjacent but historically distinct areas: the main area of PTA, including Bradshaw Army Airfield (BAAF) in the Saddle Region of central Hawaii Island, and the Keamuku area on the upper slopes of the leeward side of the island. The following discussion is organized by these two areas.

PTA, Main Area. The proposed action in the main area of PTA includes use of BAAF, nine landing zones, two drop zones, and three FARPs. Construction of improvements is proposed at BAAF Bravo helipad. The APE for BAAF is defined as the runway and aprons, as well as the area encompassing proposed improvements to the Bravo helipad. The APE for the landing/drop zones and FARPs is defined as the area delineated by perimeter points, plus a 350-ft (107-m) buffer measured from the perimeter. The buffer is intended to accommodate potential construction-related impacts to the facility, as well as rotor downwash from the MV-22.

PTA, Keamuku. Proposed activities in the Keamuku area of PTA include aviation operations at 18 landing zones, all of which are presently cleared level areas in open settings.[36] The APE is defined as the area delineated by landing zone perimeter points, plus a 350-ft (107-m) buffer measured from the perimeter. This buffer is intended to accommodate potential MV-22 downwash impacts. No construction is proposed at the Keamuku LZs.

Historic Context

PTA, Main Area. The main area of PTA falls in the central Saddle Region of the island, primarily within the ahupuaa of Kaohe in the traditional Hawaiian district of Hamakua. Kaohe extends from the Hamakua coast over the summit of Mauna Kea and encompasses most of the Saddle region and the lower slopes of Mauna Loa. A small section of east PTA falls within Humuula ahupuaa of Hilo district; sections of west PTA fall within Puuanahulu ahupuaa of Kona district and Waikoloa of Kohala district.

This high, central mountain area was not inhabited on a permanent basis in traditional times, but was traversed to get from one side of the island to the other, or was visited for specific purposes, primarily resource collection. At least four major trails may have been within the main area of PTA and possibly five others in adjacent areas (Langlas et al. 1999:24-27). These trails were likely an interconnected system of transportation routes that connected coastal population centers. Traditions relate the use of trails across the Saddle area by chiefs during times of war, particularly during the times of Umi-a-Liloa and his sons, Keawe-nui-a-Umi and Kelii-o-kaloa (Kamakau 1961; Maly and Maly 2005). Lava tubes on the central saddle served as protection from the elements and provided sources of drinking water from seeps and drips from tube ceilings (Williams 2002a:8).

Resource collection included hunting birds for feathers and food and collecting raw materials for tool manufacture. Several species of honeyeaters (*Meliphagidae*) and honeycreepers (*Drepanididae*), as well as the alala or Hawaiian crow (*Corvus hawaiiensis*), were valued by Hawaiians for their plumage (Malo 1951; Athens and Kaschko 1989). Also found in the Saddle region are shearwaters and petrels (*Procillaridae*) and nene or Hawaiian goose (*Branta sandvicensis*) that were hunted for food (Williams 2002a). Uau (Hawaiian petrel) nestlings were especially valued by the chiefs (Henshaw 1902: 102). Hawaiians may have excavated pits into pahoehoe flows or expanded existing natural breaks to create nesting habitat for uau; they may also have enlarged natural burrows in the process of retrieving nestlings (Moniz-Nakamura et al. 1998).

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[36] The Army's proposals for us of these landing zones include placement of gravel to level out the ground surfaces.

Also collected in the Saddle Region were basalt and volcanic glass for tool production. The relatively recent lava flows at PTA, especially in eastern PTA along Redleg Trail, are a primary source of volcanic glass (also called chill glass), a common material used for cutting tools. Fine-grained basalt from Mauna Kea sources was also collected and worked; Desilets (2007:7) notes that the source of the basalt could be either “quarried directly from the Mauna Kea Adze Quarry near the summit, from drainages emptying into the Saddle, or both.”

After western Contact in 1778, activity in the Saddle area did not greatly change for several decades, but as the 19th century passed, commercial interests in cattle hunting, sandalwood, and ranching brought people to this area. The hunting of feral cattle and sandalwood collection would have followed a similar pattern as traditional use of the Saddle, i.e., a transient presence to collect resources and to travel from one side of the island to the other. Cattle and sheep ranching, however, required the development of infrastructure and made a permanent mark on the landscape. Roads were built to connect grazing lands to ranch communities. Stone walls were constructed to keep sheep from wandering onto rugged lava flows.

During the mid-19th century division of lands called the Mahele, Kaohe in Hamakua district was designated government land. In 1857, Frank Spencer received a lease for the mountain lands of Kaohe from the Hawaiian government and shortly after, partnered with James Louzada and Robert Janion to create the Waimea Grazing and Agricultural Company (Maly and Maly 2005). The company established sheep stations at locations in Waimea, on the western slopes of the Saddle Region (at Keamuku and Puuanahulu), and at Humuulu in the eastern Saddle (Langlas et al. 1999:44). During this period, a network of government roads was built between population centers in Kona, Hilo, and Waimea, specifically to facilitate horse and horse-drawn cart travel (Maly and Maly 2005:116-117).

Even after the Waimea Grazing and Agricultural Company was dissolved in 1877, ranching in the Saddle Region continued well into the 1900s under separate operations by Spencer, Parker Ranch, and others (Langlas et al. 1999:51). From modest beginnings in the mid-1800s, herds grew to up to 30,000 sheep on 237,000 ac (95,910 ha).

During World War II, the Army came to the Saddle Region. Camp Pohakuloa was established in the vicinity of the current PTA cantonment, and the Army conducted training activities at an adjacent anti-tank range, artillery range, and impact area (Langlas et al. 1998:55). Saddle Road was built in 1942-1943 to allow troops to move into the interior in case of an attack (Langlas et al. 1998:55).

PTA was established as a training facility in 1956, which at that time included over 116,000 ac (46,944 ha) of land under lease and ownership by the U.S. Government (Robins and Gonzalez 2006:16-17).

Since 2009, Saddle Road (State Route 200), which connects Hilo with the west side of the island, has been undergoing realignment and reconstruction. The section through PTA, which rerouted the road to north of the cantonment area, was completed in 2009. The old alignment continues to be used by the military.

PTA, Keamuku. The Keamuku portion of PTA falls within the eastern and inland-most portion of Waikoloa ahupuaa , which has a post-Contact origin as a land unit. It was once an ili (subdivision of an ahupuaa) of a larger land area referred to as Waimea, which itself was a sub-district of the traditional district of Kohala (Escott and Keris 2009:11). In the mid-19th century Mahele, George Hueu Davis[37] received the ahupuaa of Waikoloa as Land Commission Award (LCA 8512B).

Keamuku was one of several sheep stations operated by the Waimea Grazing and Agricultural Company in the mid-1800s. Frank Spencer, one of the founders of the company, lived in the vicinity of the Keamuku station (Kaelemakule 1867; Escott 2004:41). After the Waimea Grazing and Agricultural Company was dissolved in 1877, Spencer continued the sheep operation on the sheep stations at Waimea, Keamuku, and Puuanahulu, under the name of Puuloa Sheep and Stock Co (Langlas et al. 1999:44). In 1904, all of Spencer's operations were sold at auction to Parker Ranch, which had previously (in 1903) purchased the whole ahupuaa of Waikoloa (Langlas et al. 1999:44-45).

In the early 20th century, Parker Ranch added cattle to the Keamuku operation and began farming at Waikii to produce adequate cattle feed, including corn, wheat, and alfalfa (Brennan 1974:137). Waikii evolved into a small community of worker and manager housing, a schoolhouse, farm buildings, and orchards (Langlas et al. 1999:49). The ranch continued the Keamuku sheep operation for a short period. Its sheep herders lived in the Keamuku area, either in range "shacks" in outlying areas or at the station at Keamuku (Langlas et al. 1999:46). Ranch employees at the station grew figs, peaches, and watermelons, and hunted wild pigs and kolea (golden plover) to supplement the food stocks they acquired from the neighboring village at Waikii (Escott 2004:51). In 1909, however, sheep operations at

[37] Davis was the son of Isaac Davis, who along with John Young, advised Kamehameha in his wars of conquest. They were both rewarded with large grants of land after Kamehameha came to power.

Keamuku ended when thorny weeds invaded the grazing land; the ranch then moved its sheep herd to the Humuula Sheep Station in the Saddle Region (Langlas et al. 1999:46).

Following the attack at Pearl Harbor in 1941, the U.S. military took over 50,000 ac (20,234 ha) of Parker Ranch to create the Waikoloa Maneuver Area and converted a large portion of Waimea town into an encampment named Camp Tarawa (Brennan 1974:164). The current Saddle Road was constructed in 1942-1943 to allow movement into the interior in case of another foreign attack (Langlas et al. 1999:55).

After the war, changes to the Parker Ranch cattle operation resulted in the abandonment of manned outlying cattle stations (Escott 2004:52). The Waikii station was relocated to Waimea in 1957, and the Keamuku station was abandoned by 1965 (Maly and Maly 2002: 202, 209).

In the mid-2000s, PTA expanded its training facilities to include over 22,000 acres (8,903 hectares) at Keamuku.

Archaeological and Cultural Surveys

PTA, Main Area. As of the mid-2000s, at least 39 archaeological studies have been conducted at PTA. Approximately 39,554 ac (16, 007 ha) have been surveyed and over 300 sites have been identified (Desilets 2007:12). Prior to the mid-2000s, archaeological work was concentrated in the western portion of the facility and along the southern portion of Redleg Trail on the eastern side of PTA. In the areas that include the APE, this work primarily involved pedestrian reconnaissance level surveys (e.g., Williams 2002a) and aerial reconnaissance surveys (Shapiro and Cleghorn 1995; Reinman and Pantaleo 1998a, 1998b).

As part of the transformation of the 2nd Brigade of the 25th Infantry to a Stryker Brigade in the mid- to late 2000s, archaeological work preceding development of new training facilities covered almost all of the northern portion of PTA, BAAF, and the northern portion of Redleg Trail; small areas off of the southern portion of Redleg Trail were also surveyed. Archaeological work included pedestrian surveys, review of sites for significance evaluations, and monitoring of ground-disturbing activities.

Table 4-50 summarizes the archaeological projects conducted within and in the vicinity of BAAF, the landing/drop zones, and FARPs in the main area of PTA.

Table 4-50. Previous Archaeological Investigations in and near the APEs in the Main Area of PTA

Author	Date	Description of Work	APEs	Findings Pertinent to LZs
Welch	1993	inventory survey	LZ Brad LZ Rob	Survey and testing for Saddle Road Improvement Project; no sites w/in APE
Shapiro and Cleghorn	1995	aerial recon survey	FARP 18	Survey of two areas in northern PTA; no sites w/in APE
Reinman and Pantaleo*	1998a	aerial recon survey	LZ Boogie LZ Noble LZ Tango	Survey of Training Area 1 and the Impact Area along Redleg Trail corridor; no sites w/in APE
Reinman and Pantaleo	1998b	aerial recon survey	LZ Boogie LZ Noble	Survey of two areas in northern PTA; no sites w/in APE
Williams	2002a	reconnaissance survey	LZ Boogie LZ Tango	Survey of four areas in Training Area 21, east of Redleg Trail; no sites w/in APE
Williams	2002b	reconnaissance and inventory survey	LZ Tango	Survey of 2,900 acres south of Saddle Road; inventory survey and selected testing in Training Area 21, east of Redleg Trail
Buffum, Desilets, Roberts, Robins, and Roberts	2004	systematic survey	BAAF east of FARP 18	Survey of two areas in cantonment, BAAF, and area north of Armor Road; covered all of BAAF; no sites w/in APE
Roberts, Brown, and Buffum	2004	survey	LZ Tango	Survey of Training Areas 5 and 20, and review of eligibility of volcanic glass quarries in Training Area 21 along Redleg Trail; no sites w/in APE
Roberts, Robins, and Buffum	2004	survey	FARP 12A FARP 18 LZ Noble LZ T11	Site 19490 in LZ T11 APE (north of Lava Road); no sites in other APEs
Roberts, Roberts, and Desilets	2004	reconnaissance survey	LZ Brad LZ Rob	Survey of Training Areas 1, 3, and 4; no sites w/in APE
Desilets, Roberts, Buffum, and Roberts	2005	reconnaissance survey	DZ Fisher DZ Mikilua LZ X-ray LZ Yankee	Survey of Go/No Go Maneuver Areas; no sites w/in APE
Robins and Gonzalez	2006	Phase II survey	FARP 12A FARP 18 LZ Noble LZ T11	Survey of Battle Area Complex and Anti-Armor Live Fire and Training Range on west side of Redleg Trail; mapped and tested Site 19490 in LZ T11 APE
DeBaker and Desilets	2007	monitoring	FARP 12A FARP 17 LZ T11	No sites w/in APE
Desilets	2007	monitoring (Battle Area Complex)	FARP 12A LZ T11	No sites w/in APE

Table 4-50. Previous Archaeological Investigations in and near the APEs in the Main Area of PTA

Author	Date	Description of Work	APEs	Findings Pertinent to LZs
Brown, DeBaker, and Peterson	2008	Phase II survey	DZ Fisher DZ Mikilua LZ X-ray LZ Yankee	Survey of Go/No Go Maneuver Areas and 1,010 acre area near Puu Keekee for significance determination; no sites w/in APE
Social Research Pacific	2002	cultural study	PTA	Report not available for review
Taomia	2008	survey	LZ X-ray	No sites w/in APE

* Originally reported as Shapiro, Shapiro, and Cleghorn 1998.

In addition to archaeological studies, several historical and cultural studies have been conducted in the PTA region for PTA specifically (Social Research Pacific 2002), for development and planning purposes related to astronomy use of the Mauna Kea summit (Maly 1998, 1999; PHRI 1999; Orr 2004; Maly and Maly 2005), and for planning related to Saddle Road improvements (Kanahele and Kanahele 1997; Langlas et al. 1997; Tomonari-Tuggle and Paraso 2002).

The upper slopes and summit of Mauna Kea are the site of the Mauna Kea Science Reserve, an 11,288-ac (4,568-ha) parcel leased by the University of Hawaii since 1968 for development and use as a scientific complex for astronomical research. In the late 1990s, cultural impact analyses, archival and ethnohistorical research, and oral history interviews were carried out as part of development of a master plan for the Science Reserve and an associated EIS for the master plan. Although the focus of these studies is the Science Reserve (as well as the area of the adjacent Mauna Kea Ice Age Natural Reserve), Maly and Maly (2005:Executive Summary) note that the history and cultural importance of the summit cannot be separated from its larger geographical context (i.e., the entire mountain).

PTA, Keamuku. Since the expansion of Army training into the Keamuku area in the mid-2000s, three major archaeological surveys have been undertaken (Roberts, Robins, et al. 2004; Escott 2004; Robins, Desilets, et al. 2007). The initial survey involved a Phase I reconnaissance survey of the entire Keamuku area that identified 94 possible archaeological sites, of which 72 sites were recommended for Phase II work to collect additional data to determine eligibility to the NRHP (Roberts, Robins, et al. 2004). Subsequently, Phase II work was carried out at the location of the Keamuku Sheep and Cattle Station (Sites 23499, 23515-23517 and 23539) (Escott 2004) and at the other 67 Phase II sites (Robins, Desilets, et al. 2007).

In addition to surveys carried out by contractors, PTA cultural resources staff has conducted surveys, primarily to examine specific proposed improvements for training purposes at PTA Keamuku (e.g., Head 2009). As a result, all landing zones considered in the present EIS have been fully surveyed; survey areas encompassed landing points plus a 1,640-foot (500-meter) buffer around the landing points. These surveys are documented in memoranda to the file, reposited in the PTA Cultural Resources office. Locational data are entered into the PTA cultural resources GIS database, which was used for the present study; PTA cultural resources staff provided additional information. Maly and Maly (2002) also conducted documentary research for the Waikii Homeowners Association, including much of Keamuku.

Table 4-51 and Table 4-52 summarize the cultural resources characteristics of APEs in the main area of PTA and the Keamuku area, respectively, based on the findings of the surveys described above.

Table 4-51. Cultural Resources Characteristics of the APEs at Pohakuloa Training Area, Main Area

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites***	Basis for Probability Evaluation	References
BAAF	complete	none	no/no	Completed survey	Buffum et al. 2004
Brad	unknown **	none	yes/no	PTA Army CR evaluation; in proximity to Site 23854 (volcanic glass quarry complex)	Roberts, Brown, and Buffum 2004; Roberts, Roberts, and Desilets 2004
DZ Fisher	complete	none	yes/no	PTA Army CR evaluation	Desilets, Roberts, et al. 2005; Brown, DeBaker, and Peterson 2008
DZ Mikilua	complete	none	no/no	PTA Army CR evaluation	Desilets, Roberts, et al. 2005; Brown, DeBaker, and Peterson 2008
FARP 12A	partial	none	yes/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins and Gonzalez 2006; Desilets 2007; DeBaker and Desilets 2007; in-house survey
FARP 17	partial	none	yes/no	PTA Army CR evaluation; little survey	DeBaker and Desilets 2007
FARP 18	aerial survey only	none	yes/no	PTA Army CR evaluation; aerial survey only	Shapiro and Cleghorn 1995; Reinman and Pantaleo 1998a; Roberts, Robins, and Buffum 2004; Robins and Gonzalez 2006

Table 4-51. Cultural Resources Characteristics of the APEs at Pohakuloa Training Area, Main Area

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites***	Basis for Probability Evaluation	References
Noble	partial	none	yes/no	PTA Army CR evaluation; not well surveyed	Reinman and Pantaleo 1998a, 1998b; ; Roberts, Robins, and Buffum 2004; Robins and Gonzalez 2006
Rob	complete	none	no/no	PTA Army CR evaluation; results of previous survey	Welch 1993; Roberts, Roberts, and Desilets 2004
T11	unknown **	19490	no/no	PTA Army CR evaluation; Army does not have an LZ T11 (J. Taomia, pers. Comm.)	Roberts, Robins, and Buffum 2004; Robins and Gonzalez 2006; DeBaker and Desilets 2007; Desilets 2007
Tango	complete	none	no/no	PTA Army CR evaluation	Shapiro et al. 1998; Reinman and Pantaleo 1998a; Williams 2002a; Roberts, Brown, and Buffum 2004; Robins and Gonzalez 2006
X-ray	unknown **	none	no/no	PTA Army CR evaluation; LZ location is not same as Army LZ	Brown, DeBaker, and Peterson 2008; Taomia 2008
Yankee	unknown **	none	yes/no	PTA Army CR evaluation; LZ location is not same as Army LZ; considerable number of military features ***	Desilets, Roberts, et al. 2005; Brown, DeBaker, Peterson 2008
Zulu	complete	none	no/no	PTA Army CR evaluation; considerable number of military features ****	Welch 2008; Desilets, Roberts, et al. 2005; Brown, DeBaker, and Peterson 2008

* Surface survey only.

** The LZ locations identified in the Boeing site evaluation report (Boeing 2009) do not match the locations of Army LZs. Therefore the coverage of PTA in-house surveys in regard to the present LZs cannot be determined (J. Taomia, pers. comm.).

*** The first part of the probability assessment refers to potential for surface sites; the second part refers to potential for subsurface deposits.

**** A preliminary evaluation of military features by Army cultural resources staff is that these are not eligible for the NRHP, as they are less than 50 years old (J. Taomia, pers. comm.).

Table 4-52. Cultural Resources Characteristics of the APEs at Pohakuloa Training Area, Keamuku Area

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites***	Basis for Probability Evaluation	References
Albatross	complete	historic fence line **	yes/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Head 2009
Blue Hen	complete	historic fence line **	yes/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004
Buzzard	complete	historic fence line **	yes/no	PTA Army CR evaluation	Wolforth et al. 2004; Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007
Chick	complete	none	yes/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; in house surveys
Dodo	complete	none	no/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; in house surveys
Dove	complete	military features ***	no/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; in house surveys
Emu	complete	historic fence line **	no/no	PTA Army CR evaluation; fence line complex undergoing study	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; in house surveys
Finch	complete	20855	yes/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; in house surveys
Gamecock	complete	none	yes/no	PTA Army CR evaluation; near Site 22929	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007
Kiwi	complete	none	no/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, Gonzalez 2007; Head 2009
Loon	complete	historic fence line **	no/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, Gonzalez 2007; Head 2009
Parrot Option	complete	none	no/no	PTA Army CR evaluation; considerable number of military features***	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; in house surveys

Table 4-52. Cultural Resources Characteristics of the APEs at Pohakuloa Training Area, Keamuku Area

APE	Survey Completeness*	Sites w/in APE	Probability for Addl Arch Sites***	Basis for Probability Evaluation	References
Peacock	complete	none	no/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; Head 2009
Penguin	complete	historic fence line **	no/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; Head 2009
Robin	complete	none	no/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; Head 2009
Rooster	complete	none	no/no	PTA Army CR evaluation	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; in house surveys
Seagull	complete	none	yes/no	PTA Army CR evaluation; possible cultural sensitivity due to modern burials	Wolforth et al. 2004; Roberts, Robins, and Buffum 2004; in house surveys
Turkey	complete	historic fence line **	yes/no	PTA Army CR evaluation; historic fence line runs through APE; fence line complex undergoing study	Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzalez 2007; in house surveys

* Surface survey only.

** Historic fence lines are under on-going study by PTA cultural resources staff (J. Taomia, pers. comm.). The fence lines are probably associated with sheep ranching over a long period of time. The complex of fence lines has not yet been, but may be, given a State site number.

*** The first part of the probability assessment refers to potential for surface sites; the second part refers to potential for subsurface deposits.

**** A preliminary evaluation of military features by Army cultural resources staff is that these are not eligible for the NRHP, as they are less than 50 years old (J. Taomia, pers. comm.)

Archaeological Resources

PTA, Main Area. In general, archaeological sites in the main area of PTA reflect the traditional use of the Saddle area for resource collection and transportation (e.g., lava tubes and rock shelter occupation sites; volcanic glass/basalt quarries and workshops; modified pahoehoe pits for resource exploitation; trail markers and alignments), as well as historic ranching features. Military training features have also been recorded but are considered not eligible for listing in the NRHP (J. Taomia, pers. comm.).

Only one NRHP-eligible archaeological site (Site 19490) is identified within the APE of an LZ (LZ T11). No NRHP-eligible sites are known within the APEs of the other landing/drop zones, FARPs, and BAAF.

Site 50-10-31-19490. Site 19490 is a complex of four lava tubes and blister shelters, as well as surface structures (C-shape, trail segments, and cairns) and a considerable number and variety of artifacts (1,500 pieces of volcanic glass, over 500 basalt flakes, ground stone, and ti leaf sandals) (Reinman and Pantaleo 1998a; Roberts, Brown, and Buffum 2004; Robins and Gonzalez 2006). It is located on the north side of Lava Road, in the north area of the LZ T11 APE. Radiocarbon dates place the occupation of this site from possibly as early as AD 1480 (Robins and Gonzalez 2006:42) and certainly by the mid-17th century (Reinman and Pantaleo 1998a). It is interpreted as a repeated use habitation site. The site is recorded as eligible for the NRHP based on Criterion D (Robins and Gonzales 2006:28).

PTA, Keamuku. Robins, Desilets, et al. (2007: 232) summarize the archaeological landscape of the PTA Keamuku area as consisting primarily of four categories of sites: traditional Hawaiian, ranching, government land acquisitions and public works (i.e., surveys and roads), and quarrying and collection of rock. Three of the four site types have been identified within the APEs of landing zones: military features in LZ Dove; a ranch-related fence line system within or near LZs Albatross, Blue Hen, Buzzard, Emu, and Turkey; and an historic road (Site 20855) in LZ Finch. Only the historic road has been recorded and assigned a State of Hawaii site number.

Site 50-10-21-20855. Site 20855 is the old Kona to Waimea government road (Langlas et al. 1999; Roberts, Robins, and Buffum 2004; Robins, Desilets, and Gonzales 2007). Langlas et al. (1999:81) report that it was constructed sometime between 1916 and 1922 by the Hawaiian Government, using laborers housed at a nearby prison camp. It is recorded as eligible for the NRHP under Criteria A (reflecting trends in the development of transportation routes for horse-drawn carts and motor vehicles) and D (information potential describing methods of government road construction and procurement of resource materials) (Robins, Desilets, and Gonzales 2007:45). The Federal Highways Administration (FHWA) has determined that the culverts are eligible under Criterion C because they embody distinctive characteristics of a type and period of construction of historic roads in Hawaii (Langlass et al. 1999, and FHWA and SHPO correspondence).

The historic fence lines, fence posts, and other ranching features are under on-going study by PTA cultural resources staff with the goals of obtaining site numbers and evaluating NRHP eligibility (J. Taomia, pers. comm.). The fence lines are probably associated with sheep and/or ranching over a long period of time.

Military features, most of which are less than 50 years old, are evaluated to be not eligible for listing in the NRHP (J. Taomia, pers. comm.).

Traditional Cultural Resources

PTA, Main Area. There are no identified burials or other traditional cultural resources within or in the near vicinity of the LZ, DZ, or FARP APEs in the main area of PTA. BAAF, however, touches the lower edge of the portion of Mauna Kea described as a "sacred landscape that is a physical and spiritual connection between one's ancestors, history, and the heavens," that is, from approximately the 6,000-ft (1,829-m) elevation to the summit (Maly 1999:Table 2a; PHRI 1999:Table 2b). The mountain is also referred to as "ka piko kaulana o ka aina," the famous summit or center of the land.

Maly (1998:29) suggests that the entire mountain, from 6,000 ft (1,829 m) above sea level to the summit, be considered a traditional cultural property. This suggestion is reiterated in Simonson and Hammatt (2010:204), a cultural impact assessment for the Thirty Meter Telescope EIS. This determination for eligibility to the NRHP has not yet been made.

PTA, Keamuku. There are no identified traditional cultural resources within the APEs of the Keamuku landing zones.

4.9.2.4 Pacific Missile Range Facility (PMRF), Island of Kauai

Areas of Potential Effect

The proposed action at PMRF includes the use of the Barking Sands airfield for aviation training; no construction is proposed. Helipads on the taxiway are on existing paved areas in the highly developed central area of PMRF. The APE for the landing zone encompasses an area defined by the landing zone perimeter and a surrounding 350-ft (107-m) buffer. The APE also encompasses the paved southern runway and an approximate 100-ft (30-m) buffer beyond the runway edge on all sides. The buffer zones are intended to accommodate potential impacts from rotor downwash from the MV-22.

Historic Context[38]

PMRF lies at the seaward edge of the Mana Plain in the traditional Hawaiian ahupuaa of Waimea in the district of Kona. Covering much of the plain between the coastal dune and the base of the central mountain is a former wetland; early 20th century maps show three large ponds and marshlands covering almost 2,000 ac (809 ha) in the northern half of the plain. These wetlands were important habitat and nesting environment for Hawaiian water birds; both fish and birds were valuable subsistence resources for Hawaiians. Taro and fish were cultivated in the wetland, and ducks and other birds were hunted. Permanent residences were located at the inland edge of the plain at the foothills of the central mountain. From here, the Mana community could access the forest resources of the upland mountains and was in easy reach of the coast and the wetlands.

The coastal dune and back beach areas were the setting for small fishing communities or temporary camps that were likely concentrated near optimum localities such as breaks in the reef where canoes could be launched or where reefs provided rich habitat for near-shore marine resources. The dunes were also used for burials.

In the mid-19th century Mahele, the ahupuaa of Waimea was claimed by the king as Crown Lands. In the 1860s, Kamehameha IV appointed Norwegian immigrant Valdemar Knudsen to manage the Crown Lands in the Waimea area. Knudsen initially raised cattle and horses, but a decade later, he began planting sugarcane in partnership with Captain Christian L'Orange. By 1898, sugarcane production was up, helped by the development of artesian wells for irrigation; the Kekaha Sugar Company was formed in that year. Commercial rice cultivation was also taking place on land leased from Knudsen, but rice fields were eventually absorbed by the sugar company. While Hawaiians had found the marshlands to be an important resource, the sugar company saw them as impediments to expanding fields. Starting in 1878, Kekaha Sugar Company excavated ditches to drain the land. By 1931, approximately 3,000 ac (1,214 ha) of the Mana Plain had been reclaimed for sugar cultivation.

In 1940, 549 ac (222 ha) in Mana were transferred from the Territory of Hawaii to the U.S. War Department. With the addition of another 1,509 ac (611 ha) shortly after, the area was transformed into an Army Air Corps installation called Barking Sands Army Air Base. Work on the runway began in 1940. The primary mission of the airfield was Army Air Corps flight training. In 1944, the Navy was granted permission to use the facilities for practice carrier

[38] This section is taken largely from the 2005 PMRF *Integrated Cultural Resources Management Plan* (ICRMP; Tomonari-Tuggle and Yoklavich 2005).

landings and general training. After June 1944, the base provided service, equipment, and maintenance for Army B-24 bomber replacement crews and planes en route from the U.S. mainland to forward areas in the Pacific theater. The basic layout of the installation was largely established during World War II.

With the creation of the Air Force as an independent service unit in 1947, Barking Sands Army Air Base was redesignated Barking Sands Air Force Base. Within a year, however, the Air Force declared the base excess and deactivated the facility. The process of returning the property to the Territory of Hawaii was initiated, only to be abruptly interrupted by the Korean Conflict. In 1953, the Barking Sands facility became Bonham Air Force Base. Three years later, the Air Force and Navy signed a joint-use agreement. By 1961, the Navy had become the primary user of the installation. In 1964, 1,885 ac (763 ha) of the Mana Plain were officially transferred to the Navy. Two years later, the facility was renamed the Pacific Missile Range Facility.

Archaeological and Cultural Surveys

Extensive archaeological work has been carried out at PMRF (summarized in Tomonari-Tuggle and Yoklavich 2005:70-71). Nearly the entire installation has been surveyed for surface remains, and numerous investigations have involved some form of subsurface testing, either as systematic archaeological excavation or monitoring of construction activity. Table 4-53 lists the studies that cover the APE. Also included in this table is Flores and Kaohi (1992), a cultural study that included research on traditional accounts as well as oral history interviews.

Table 4-53. Previous Archaeological Investigations in and near the APE of Pacific Missile Range Facility

Author	Date	Description of Work	Location	Findings Pertinent to LZs and Other Improvements
Soehren	1965-67	survey	LZ Barking Sands	North end of southern runway—habitation deposits and disturbed human remains in dune (Site 0826)
Flores and Kaohi	1992	cultural study	PMRF	PMRF and general Mana Plain—no formal cultural places, but identified traditional practice of fishing along the Mana coast
Wulzen et al.	1997	reconnaissance survey	LZ Barking Sands	Seaward side of southern runway—traditional Hawaiian cultural deposit, including human remains, in dune (Site 2027)
Inouye	n.d.	staff records	LZ Barking Sands	South end of southern runway—human remains in dune (Site 1833/1885)

Table 4-54 summarizes the cultural resource characteristics of APEs at PMRF based on the findings of the surveys described above.

Table 4-54. Cultural Resources Characteristics of the APE at Pacific Missile Range Facility

APE	Survey Completeness*	Sites w/ in APE	Probability for Addl Arch Sites	Basis for Probability Evaluation	References
Barking Sands	partial	0721, 0826, 1833, 1885, 2027, 2028	yes	2005 ICRMP; runway sits on coastal dune that contains cultural deposits and burials.	Soehren 1965-1967; Wulzen et al. 1997; Inouye n.d.; Tomonari-Tuggle and Yoklavich 2005

* Surface survey only.

Archaeological Resources

Archaeological sites at PMRF reflect three historical periods: traditional Hawaiian, plantation, and military. Traditional Hawaiian sites are largely restricted to the coastal dune, a factor of World War II construction during which large areas of the back beach were graded for runways, revetments, gun emplacements, offices, housing, and support operations. This activity obliterated evidence of Hawaiian occupation of this zone, except for isolated deposits that are remnants of the former landscape. Similarly, plantation sites are also scattered remnants. Sites identified in the PMRF APE are associated with all three periods (Table 4-55).

Table 4-55. NRHP-Eligible Archaeological Sites within the APE at PMRF

Site No. *	Description	NRHP Signif **	References
0721	Kawaieli Ditch; cultural place and plantation era historic ditch	A	Drolet et al. 1996; Tomonari-Tuggle and Yoklavich 2005
0826	Traditional Hawaiian cultural deposit, disturbed burial	D	Soehren 1965-1967
1833/ 1885	Traditional Hawaiian human remains in eroding coastal dune deposit	cultural	Inouye n.d.; Drolet et al. 1996
2027	Traditional Hawaiian cultural deposit	D	Wulzen et al. 1997
2028	One concrete structure and two wooden structures; WWII era	A	Wulzen et al. 1997

* State of Hawaii site number, with prefix “50-30-05-” (50=State of Hawaii, 30=island of Oahu, 05=USGS Kekaha topographic quadrangle).

** The NRHP significance has not yet been evaluated by the SHPO (see Section 3.9.1 for definitions of significance criteria).

Site 50-30-05-0726. This site is Kawaieli Ditch, dug in 1878 to drain the Kawaieli wetlands to create 50 ac (20 ha) of usable land for sugar cultivation. An original form of the ditch is said to have been constructed by menehune (a legendary race of small people who preceded the human settlement of the islands) (Tomonari-Tuggle and Yoklavich 2005:81), and some form of the ditch was certainly used in the functioning of Kawaieli wetlands for pre-Contact aquaculture. Kikuchi (1987:9) writes that the ditch served to enhance the natural body of water by allowing the in-flow of ocean water during high tide. The ditch is considered eligible for listing in the NRHP under Criterion A.

Sites 50-30-05-0826, 1833/1885, and 2027. These sites consist of dune cultural deposits and burials that are part of an extensive occupation complex that extends intermittently from Nohili at the northern end of PMRF to Waiokapua Bay near the southern end of the base. This stretch of coastline is the seaward edge of a conjunction of resource areas (wetlands, ocean, and alluvial fan) and thus would have been a desirable habitation locale (Tomonari-Tuggle and Yoklavich 2005:91). The deposits contain charcoal and midden, as well as human remains. Sites 0826 and 2027 have been recorded as eligible for listing in the NRHP under Criterion D. Site 1833/1885 consists of human remains that were exposed in the eroding dune and were reburied in place (Inouye n.d.; Tomonari-Tuggle and Yoklavich 2005:91).

Site 50-30-05-2028. Site 2028 consists of one concrete and two wooden structures that are interpreted to be a gun emplacement on the seaward side of the north end of the LZ Barking Sands runway. It is considered eligible for listing in the NRHP under Criterion A, as part of the key World War II development to protect the airstrip from possible enemy attack. Other components include revetments, gun emplacements, and pillboxes.

Traditional Cultural Resources

In addition to the burials described above in Sites 0826, 1833/1885, and 2027, the Kawaieli Ditch (Site 0726), is considered a traditional cultural place (TCP), based on its association with the menehune (Tuggle and Tomonari-Tuggle 2001:180).

4.9.2.5 Training Areas on the Islands of Molokai and Maui

Molokai Training Support Facility (MTSF), Island of Molokai

Area of Potential Effect

The proposed action would involve aviation training at MTSF and minor construction. The APE for MTSF is defined as the landing zone plus a buffer area of 350 ft (107 m) from the LZ perimeter. The buffer is intended to accommodate potential impacts from physical improvements to the facility, as well as rotor downwash from the MV-22. The APE is a graded and leveled area.

Historic Context

MTSF falls within the traditional district of Kona in the ahupuaa of Palaau. Palaau consists of three discrete parcels (called apana): Palaau 1 lies on the south coast and includes spring-fed marshes that were once developed in irrigated taro fields (Summers 1971:77); Palaau 2 is on the central saddle and is the largest of the three apana; and Palaau 3 lies on the edge of the north cliffline overlooking Kalaupapa Peninsula.[39]

Little is known of the pre-Contact settlement of the central saddle area of Molokai. Major and Dixon (1995:27) suggest that this area was part of a community resource system that replicated the archetypal ahupuaa that extended from the ocean to mountains. The three apana of Palaau provided a full range of resources: fishpond and ocean resources, as well as irrigated taro; sweet potato, dryland taro, and other arid land crop cultivation; and northeast upland forest resources.

The ahupuaa of Palaau was designated Crown Lands in the mid-19th century Mahele. In 1888, it was leased to Charles Bishop, who had acquired the adjacent large western ahupuaa of Kaluakoi through a land grant (Grant 3146). During this period, ranching developed on the central and the west side of the island. In 1897, Bishop sold his Molokai holdings to American Sugar Company, which eventually became Molokai Ranch Company.

A significant event in the history of central Molokai was the establishment of the Hawaiian Homes Commission in 1921. The purpose of the commission was to manage former Crown and government lands of the Hawaiian kingdom for the benefit and rehabilitation of individuals who were of half or more Hawaiian ancestry. In 1924, residential, agricultural, and pastoral lots were awarded in central Molokai. This homestead area is generally called Palaau-Hoolehua. There was initial success at farming but homesteaders were faced with innumerable natural and economic hardships (McGregor 2007:230-232). By 1926, many of the Palaau-Hoolehua homesteaders entered into contracts with the Libby, McNeill & Libby Company to grow pineapple on their agricultural lots. Pineapple was the major industry on the island until the 1980s, when plantation operations were closed.

[39] This three-part division of Palaau is generally shared by the other ahupuaa of central Molokai (Iloli, Kahanui, Hoolehua, and Naiwa); that is, a large area on the saddle, a small parcel on the south coast, and another small parcel overlooking Kalaupapa.

In 1929, air service between Honolulu and Molokai was inaugurated on the newly opened dirt runway of Molokai Airport, built on Hawaiian Homes land. In May 1941, the MTSF parcel was transferred by EO 936 to the U.S. Navy as the Molokai Airport Naval Reservation. This was one of several executive orders that conveyed land around the airport to the Army and Navy. With the coming of war, control of the airport was taken over by the armed services, which retained authority over the facility until 1947, when management was returned to the Territory of Hawaii. The MTSF parcel remained under military authority.

Archaeological and Cultural Surveys

Two archaeological surveys have been conducted within and near MTSF. In 1980, Connolly (1980, reported in Dega 1997:6) recorded seven sites in a reconnaissance survey of the Molokai Airport grounds and areas targeted for possible extension. In 1997, Dega (1997) carried out monitoring and sampling associated with the removal of five underground storage tanks (USTs) at MTSF. There have been no studies of cultural sites either in or near the APE.

Archaeological Resources

No archaeological sites have been identified within the MTSF APE.

Traditional Cultural Resources

No traditional cultural resources have been identified within the APE.

Kalaupapa Airport, Island of Molokai

Area of Potential Effect

The proposed action at Kalaupapa Airport would involve aviation training at the airport but no construction. The APE is defined as the entire National Historic Landmark (NHL). In considering potential impacts of MV-22 aircraft downwash on archaeological resources, the analysis focuses on the existing Kalaupapa Airport Runway 05-23 plus an approximate 100-ft (30-m) wide zone around the paved runway.

Historic Context

Kalaupapa Peninsula falls within the district of Koolau in the traditional ahupuaa of Makanalua. Early settlement on the peninsula likely occurred in the period between AD 1200 and 1400; population grew into differentiated communities based on development of a large scale dryland field system for sweet potato cultivation (McCoy 2006:326).

Little is written of the early post-Contact years on the peninsula. A mission station was established sometime before 1836. The first known resident missionary on Kalaupapa was a Hawaiian teacher named Kanakaokai, who came to the peninsula in 1839; a stone meeting house was built shortly after his arrival (Goodwin 1994:38). In 1839, the population of Kalaupapa Peninsula was estimated to be around 1,000 people (Ladefoged 1990:6), although it had dropped to 350 by 1853 (Somers 1985:25).

Visitors to the peninsula in the 1850s described flourishing fields of sweet potato (Remy 1893, referenced in Ladefoged 1990:6-7), a crop grown for subsistence and for export to California, which was a booming market because of the Gold Rush. Archaeological work at the north end of the peninsula provides evidence of extensive fields and a 19th century farmstead (Goodwin 1994).

With the Mahele in the mid-19th century, Makanalua was awarded to high chief Kekauonohi. Upon her death in 1851, the ahupuaa went to her husband, Levi Haalaea. In 1866, after his death, Makanalua and neighboring Kalawao ahupuaa were purchased by the government for development of a leprosy colony (Goodwin 1994:35). Kalaupapa ahupuaa, west of Makanalua, was acquired for the colony in 1873.

Leprosy (Hansen's Disease) was introduced to Hawaii sometime between 1830 and the mid-1840s (Goodwin 1994:35). By the end of 1864, the number of leprosy cases had increased to the point that isolation was seen as the only way to prevent the further spread of the disease. In 1865, Kalaupapa Peninsula was selected as the site of the leprosy colony, which served as the quarantine settlement for individuals with Hansen's disease until it was closed in 1969.

By the early 1900s, the leprosy community centered on the west coast of the peninsula. A landing and dock provided the main connection to the outside world. In 1934, the airport with a grass strip was opened for business and provided an alternative to the landing (http://hawaii.gov/ hawaiiaviation/ hawaii-airfields-airports/molokai/kalaupapa-airport/). The runway was paved in 1953. By 1987, airport lands had expanded from the original 16 ac (6.5 ha) to 42 ac (17 ha).

Kalaupapa was designated as a National Historic Landmark (NHL) in 1976. In 1980, the Kalaupapa National Historical Park was established. The National Park Service controls, through ownership or cooperative agreements, all of Kalaupapa Peninsula, the Nihoa landshelf west of the peninsula, and the large valleys of Waikolu, Waialeia, and Waihanau Valleys to the east.

Archaeological and Cultural Surveys

Since the late 1980s, several cultural resource management studies have been conducted on Kalaupapa Peninsula, including five associated with airport improvement projects (Athens 1989; Ladefoged 1990; Goodwin 1994; Cochrane 2000; Rieth 2007). Academic research projects have focused on the eastern half of the peninsula and adjacent valleys (Kirch 2002; McCoy 2006). McCoy (2007:1275-1282) provides a comprehensive compilation of radiocarbon dates for Molokai, including Kalaupapa Peninsula. Greene (1985) presents a history of the peninsula and assessment of cultural resources for the National Park Service.

Archaeological Resources

One archaeological site is located within the 100-ft (30-m) zone encompassing the Kalaupapa Airport runway.

Site 50-60-03-1897. Site 1897 is a complex of at least 54 small rock features scattered over an area of roughly 328 by 656 ft (100 by 220 m) south of the airport runway. Components include rock piles, linear mounds, low walls, enclosures, C-shaped structures, and small platforms that are interpreted to be part of an integrated agricultural and habitation complex. The site extends to the southeast, as indicated on the site map drawn by Cochrane (2000: Figure 2), which notes that there are three enclosures and a platform in the area to the southeast of his survey area.

Site 1897 was first recorded by Cochrane (2000) during a fence line monitoring project. Rieth (2008) subsequently documented 19 additional features in the site area. Based on proximity to these features, rock mounds, low walls, and C-shaped structures identified by Ladefoged (1990; Features 1E through 5E) also likely fall within Site 1897 (Cochrane 2000:Figure 2 includes Feature 1E for locational reference). The site has not yet been evaluated for eligibility for listing in the NRHP.

The 100-ft (30-m) zone surrounding the airport runway touches the northern edge of the site and includes only low rock mounds and walls (Cochrane Feas. 1-3 and 6-10; Rieth Feas. 1-3; Ladefoged Feas. 1E and 4E).

Traditional Cultural Resources

There are no identified traditional cultural resources within the APE.

Hawaii Army National Guard (HIARNG) Facility, Island of Maui

Area of Potential Effect

One landing zone at the HIARNG Facility is proposed for use by the VMM and HMLA squadrons; no construction is planned. The APE encompasses an area defined by the landing zone and a surrounding 350-ft (107-m) buffer. The buffer zone is intended to accommodate potential impacts from MV-22 rotor downwash. The LZ is situated on a paved area of the former air station runway.

Historic Context

The HIARNG Facility lies in the southeastern portion of central Maui, on the arid, sandy lowlands between the two high mountains of the island. It is largely within the ahupuaa of Pulehunui in the traditional Hawaiian district of Kula. This area was once covered in expansive sugarcane fields and was also the site of Naval Air Station (NAS) Puunene.

The primary traditional use of the central Maui lowlands was likely the collection of specialized resources like pili grass on the central plain or marsh birds around Kealia Pond to the south. Cultivation would have been limited by available rainfall, lack of permanent water, and poor soils. Habitation would have been scattered, with the closest concentration of traditional settlement being at the southern coast of the island.

A major historical event that took place on the central lowlands was a 1776 invasion by warriors of Kalaniopuu, the ruling chief of Hawaii, against the Maui chief Kahekili (Fornander 1969:153). Part of Kalaniopuu's forces landed near Kealia Pond on the south shore of the central lowlands and marched across the island isthmus to meet the forces of Kahekili at Wailuku. In a bloody battle, the Hawaii army was annihilated. Several years later, the new Hawaii island chief Kamehameha led another invasion of the island, again landing on the southern shore of the central isthmus. This time, the Hawaii army was successful (Stoddard 1894).

With the division of lands among the king, the chiefs, and the government (the Mahele) in the mid-1800s, the ahupuaa of Pulehunui was granted to the chief Keaweamahi. Emelia Keaweamahi and her husband, Kaikioewa, were successive governors of the island of Kauai between 1824 and 1842. They were also the kahu or guardians of Mosese Kekuaiwa (grandson of Kamehameha), and it is probably because of this role that Keaweamahi was granted the Mahele award (Kameeleihiwa 1992:224). There were no kuleana awards to commoners in Pulehunui.

The late years of the 19th century saw the beginning of the Maui sugar industry. In 1882, the sugar company Hawaii Commercial and Sugar Company (HC&S) was established. Presently owned by Alexander & Baldwin, it is the last remaining sugar plantation in Hawaii. Puunene Mill was (and still is) the hub of HC&S activity.

The late 1930s and World War II brought major changes to Maui's central lowlands. In 1938, construction began on Puunene Airport, which was intended to be the island's major airport for inter-island commercial flights. In 1940, the runway was expanded and plans were started to develop improved passenger accommodations. Also in 1940, the Navy acquired a small parcel at the southeast end of the runway for use as an auxiliary field of NAS Pearl Harbor (Tuggle et al. 2001:25). Very quickly, officers' quarters, barracks, offices, mess and galley, and a hangar were completed.

With the advent of war in 1941, the Navy expanded its small base into a naval air station. NAS Puunene's primary mission was to provide fighter aircraft training, a mission shared by no other base in Hawaii or elsewhere in the Pacific. Between 1941 and 1945, approximately 108 Navy squadrons rotated through NAS Puunene for training. There were over 250 aircraft on station at the any given time (Maui Military Museum 1996).

At the end of the war, NAS Puunene entered caretaker status, and by November 1945, it was reduced to a Naval Air Facility under the command of NAS Kahului (Tomonari-Tuggle et al. 2001:36). It was disestablished a year later, and in 1947, the Navy ended its operations on Maui.

For a brief period, the former NAS Puunene returned to its role as the primary commercial airport on the island. However, in May 1951, commercial inter-island operations were moved to Kahului, which took over as the key airport on Maui. Up until the early 1990s, large portions of the area of NAS Puunene were in sugarcane cultivation and cattle pasturage. The runways remained intact, however, and were used for a variety of purposes, including a pig farm, dirt biking, and moto-cross (Tomonari-Tuggle et al. 2001:50). Maui teenagers took impromptu driving lessons on the old runway and used it as a drag strip (S. Sakai, pers. comm.). In the mid-2000s, HIARNG took over the area of the original Navy base area for its new armory.

Archaeological and Cultural Surveys

The primary archaeological and cultural research undertaken for the area around the HIARNG APE is Tomonari-Tuggle et al. (2001), a comprehensive historical, oral historical, and archaeological survey of the former NAS Puunene. Drolet and Sinoto (1998) carried out an inventory survey related to the preparation of an EA for the HIARNG armory.

Archaeological Resources

One site is located within the APE of LZ Armory.

Site 50-50-09-4164. Site 50-50-09-4146 consists of the remains of a portion of the World War II era NAS Puunene. The portion within and adjacent to the LZ APE is the main base area of the former Navy facility. It includes the concrete pad and post foundations of most of the buildings from this earliest period of base construction. There are also four standing buildings (two pump houses, a swimming pool complex, and a pyrotechnic locker).

The site has been determined to be eligible for listing in the NRHP, based on significance Criterion A for its association with World War II in Hawaii and the Pacific, and Criterion D for its potential to yield information (Hibbard 1996). Tomonari-Tuggle et al. (2001:123-124) adds that the site is also considered eligible under Criterion C: "most of the remaining buildings at NAS Puunene should be considered resources that embody 'the distinctive characteristics of a type, period, or method of construction… or that represent a significant and distinguishable entity…'"

Traditional Cultural Resources

There are no identified burials or traditional archaeological or cultural sites within the APE.

4.9.3 ENVIRONMENTAL CONSEQUENCES

This section discusses potential impacts of the proposed action (Alternatives A and B) and No Action Alternative on identified archaeological and traditional cultural resources. Training areas consist mainly of existing airfields and landing and drop zones. Construction is proposed at three of the training areas to upgrade existing facilities to accommodate MV-22s. Improvements may involve clearing and grading, as well as removal of old paving and installation of new paving. Potential impacts on archaeological sites would be due primarily to ground-disturbing activity related to such construction activities and from rotor downwash during aviation training.

4.9.3.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

As summarized in Table 4-40, all of the APEs have undergone both surface and subsurface examinations for archaeological resources. Only LZ Gull contains surface structures (the plantation era Site 3309). Although Desilets and Dye (2002:32-33) found no cultural deposits in a 10-ft (3-m) deep pipeline trench across the width of the runway, there remains the possibility that discontinuous deposits (similar to Site 4851) may exist in this area.

The APEs in the southern runway complex do not have surface archaeological features, but LZs Owl and Hawk fall within the boundaries of Site 4851, which is an extensive but discontinuous subsurface cultural deposit containing charcoal, midden, artifacts, and buried pit and hearth features. Burials have also been found in site deposits. Site 4851 deposits occur under 12 to 67 in (30 to 170 cm) of coral fill from the World War II runway construction. The areas of LZ Noni and DZ Tiger are heavily graded; they have been archaeological tested for subsurface deposits and none have been found. Areas adjacent to the runway are densely vegetated with alien plants which provide an added layer of protection to the buried cultural deposits.

It should be noted that runway construction cannot be assumed to have removed all evidence of Hawaiian occupation. Major and Dye (2006:56) found a paleosol with evidence of cultural activity beneath Runway 12–30, thus indicating that "construction of the runways did not always entail destruction of cultural deposits." They also recorded two sets of human remains uncovered under 33 to 35 in (85 to 90 cm) of fill under the paved runway apron north of Building 700 (Major and Dye 2006:47-48).

Construction Impacts

Landing zones at MCTAB are on paved areas of World War II era runways; the 350-foot (107-meter) buffers to address rotor downwash concerns extend off the paved surface. The drop zone (DZ Tiger) is in the open area in the middle of the southern runway complex.

With the exception of Site 3309, a complex of plantation era surface structures, archaeological sites in the MCTAB APEs are subsurface cultural deposits buried under 12 to 67 in (30 to 170 cm) of coral and/or sand fill. Should training area improvements require ground disturbance over 12 in (30 cm) deep, mitigation measures developed through NHPA Section 106 consultation and documented in the Programmatic Agreement (PA) would be implemented. Alternative measures could include avoidance, data recovery, and/or monitoring during construction.

There would be no construction impacts with the No Action Alternative.

Operational Impacts

Rotor downwash from MV-22 operations is not anticipated to have an effect on Site 4851 because of the depth of the buried cultural deposits; Site 3309 consists of surface structures that would not be affected by rotor downwash. With the No Action Alternative, no change and no impact would occur. No mitigation is required.

4.9.3.2 Army Training Areas, Island of Oahu

Operational Impacts

With no construction planned at these training areas, the discussion below focuses on operational impacts.

Kahuku Training Area (KTA)

Table 4-43 summarizes the status of archaeological surveys at KTA and the probability of encountering additional resources. LZ Kahuku Range and DZ Kanes have been surveyed for surface remains. Only portions of the other two LZs (Kahuku Split Rock and X-Strip), or areas immediately adjacent to the LZs, have been surveyed. No subsurface testing has been conducted at any of the LZs.

No archaeological or traditional cultural resources have been identified in the APEs of the KTA landing zones. However, as archaeological surveys have not been complete, there is a potential for encountering additional surface features at LZs Kahuku Split Rock and X-Strip, as well as subsurface features at all four LZs. The extent of impacts due to MV-22 downwash would depend on the location and depth of such features. Mitigation, if needed, would be documented in the PA prepared as part of the NHPA Section 106 process.

No impacts would be associated with the No Action Alternative. No mitigation is required.

Kawailoa Training Area (KLOA)

As summarized in Table 4-45 only LZ Puu Kapu has been fully surveyed for surface remains. Portions of LZs Black and Non Stop have been surveyed as part of a sample survey of the training area. The other LZs have not been surveyed. There has been no testing for the presence of subsurface deposits in any of the LZs, except at LZ Puu Kapu, where the Site 5636 firepit was exposed in the surface of a road cut. The firepit was excavated (Kaschko and Dega 2005) and is considered no longer significant.

Dega and McGerty (2002a:137, 2002b:157) generally reiterate the previously developed model of archaeological sensitivity (Anderson 1998), in which the potential for archaeological sites is greatest in the lower, wider stream valleys with perennial flows, gradual foot slopes, and alluvial stream flats; site potential is lowest in the rugged uplands, including ridges and upper valley reaches that are normally characterized as extremely steep mountainous land.

Following this model, the Kawailoa LZs have low potential for archaeological sites. However, there remains the possibility that archaeological resources exist in the LZs, particularly subsurface deposits such as the Site 5636 fire feature that was exposed in a road cut in LZ Puu Kapu. Dega and McGerty (2002a, 2002b) suggest that arboriculture was carried out in the rugged KLOA region. If so, ridge/plateau areas in proximity to utilized stream valleys may have been used for arboriculture purposes. For example, LZ Puu Kapu, in which the Site 5636 fire feature was found, is situated just north of several sites in the valley of Kawainui Stream, including Sites 5606 and 5612, which is a large complex of agricultural and habitation features that may date to the AD 15th century.

The assessment of probability for additional archaeological sites within the APEs is based on consultation with USAG-HI cultural resources staff.

Other than Site 5636, which has been excavated, no archaeological or traditional cultural resources have been identified in the APEs of the KLOA landing zones. The potential for encountering sites is low, based on evaluations of archaeological sensitivity. However, given the possibility that archaeological resources may exist at the LZs, there is a potential for impacts due to MV-22 downwash. The extent of impacts due to MV-22 downwash would depend on the location and depth of such features. Mitigation, if needed, would be documented in the PA prepared as part of the NHPA Section 106 process.

No impacts would be associated with the No Action Alternative. No mitigation is required.

Schofield Barracks East Range (SBER)

All LZs proposed for training have been partially or completely surveyed for surface remains. No testing has been conducted for the presence of subsurface deposits. This is summarized in Table 4-46.

The assessment of probability for additional archaeological sites within the APEs is based on consultation with USAG-HI cultural resources staff.

No archaeological or cultural sites have been identified in the APEs of the landing zones at SBER. Since no subsurface testing has been conducted, the probability of encountering subsurface features is high. Potential MV-22 downwash impacts on such features would depend on their location and depth. Mitigation, if needed, would be documented in the PA developed as part of the NHPA Section 106 process.

No impacts would be associated with the No Action Alternative. No mitigation is required.

Dillingham Military Reservation (DMR)

The APEs at DMR have been surveyed for surface archaeological remains, and some testing for subsurface deposits has also been carried out (see Table 4-51). Test excavation in the area of Site 5487 (in LZ Albatross) exposed possible buried agricultural soils that may relate to irrigated agriculture on the coastal plain at Dillingham (McGerty and Spear 2001). Based on this finding, as well as Moblo's (1991:13) evaluation of potential for buried cultural deposits under the runway, there is the possibility that subsurface cultural deposits exist in heavily-modified areas of the installation.

The revetments in the southern and western portions of DMR are currently being recorded and evaluated as a historic complex (L. Gilda, A. Exzabe, personal communication). Revetments fall within the APE of LZs Rooster, Blue Jay, and Albatross.

The archaeological sites in the APEs of the DMR landing zones are surface structures (revetments) that would not be affected by MV-22 rotor downwash. While subsurface deposits may be present in the APEs beneath paved surfaces, operations at the LZs would not affect subsurface deposits. The proposed training would have no effect on archaeological resources at DMR.

No effects would be associated with the No Action Alternative. No mitigation is required.

4.9.3.3 Pohakuloa Training Area (PTA), Island of Hawaii

Table 4-51 summarizes archaeological surveys that have been conducted in the PTA APEs. In the main area of PTA, six of the 15 APEs (BAAF, DZs Fisher and Mikilua, and LZs Rob, Tango, and Zulu) have been surveyed for surface remains. The entire BAAF area, from north of the runways to the old Saddle Road alignment (now called Lightning Road), was found to exhibit "substantial evidence of historic and modern disturbances associated with the construction and operation of airfield facilities" (Buffum et al. 2004:55). No sites were found in this highly disturbed area (which is larger than the BAAF APE). The three FARPs and LZ Noble have been partially surveyed. FARP 18 has been examined only by aerial reconnaissance; this type of survey, however, has been problematic in that small openings to lava tubes, a common type of habitation feature in the Saddle Region, are difficult to identify from the air.

LZs Brad, T11, X-ray, and Yankee are tentatively identified as having been surveyed. However, the locations for the LZs provided in the Boeing site evaluation report (Boeing 2009) differ slightly from PTA Range Control locations. The LZ site assessments provided by PTA cultural resources staff is based on the Range Control locations.

Only one site is located within the APEs of the main area of PTA. Site 19490 falls within the APE of LZ T11, but it is separated from the landing zone by the graded Lava Road.

All LZs in the Keamuku area of PTA have been surveyed. Site 20855 (old Kona to Waimea Government Road) lies within the APE of LZ Finch. Historic fence lines, which are presently being recorded and evaluated as a complex, occur in the APEs of LZs Albatross, Blue Hen, Buzzard, Emu, Penguin, Loon, and Turkey.

Construction Impacts

Construction is planned only at BAAF, where no archaeological sites have been found. There would be no construction impacts at BAAF.

Operational Impacts

Except for Site 19490 in LZ T11 in the main area of PTA and Site 20855 in LZ Finch in Keamuku, there are no recorded archaeological or traditional cultural resources in the APEs of the landing/drop zones at PTA. Neither of these sites contains features that would be vulnerable to MV-22 rotor downwash, and Site 19490 is separated from the LZ perimeter by Lava Road.

At most of the LZs/DZs/FARPs, the probability of encountering additional archaeological sites is low. For those sites which have not been completely surveyed for surface features (the three FARPs and LZs Brad, Noble, and Yankee), subsurface features may be present. The potential for MV-22 downwash impacts would depend on the location and depth of such features. Mitigation, if needed, would be documented in the PA developed in the NHPA Section 106 process.

No impacts would be associated with the No Action Alternative. No mitigation is required.

4.9.3.4 Pacific Missile Range Facility (PMRF), Island of Kauai

Operational Impacts

The PMRF APE has been partially surveyed for surface sites; there is a potential for buried deposits (see Table 4-54). The APE is in an area known to have buried cultural deposits and human remains (Tomonari-Tuggle and Yoklavich 1995:141). Even in the highly developed areas of PMRF, there is potential for intact subsurface deposits reflecting the traditional Hawaiian occupation of this former coastal dune and backbeach area (Tomonari-Tuggle and Yoklavich 1995:141).

Rotor downwash with the potential to disturb unpaved surfaces would be limited to the existing runway and taxiway. In addition, aircraft would avoid impacting the dune areas, so there would be no effect on the cultural deposits in Sites 0826, 1833/1885, and 2027. With Alternative A or B, there would be no impacts on surface archaeological features, which include a ditch and a gun emplacement. No mitigation is required. With the No Action Alternative, no impact would occur. No mitigation is required.

4.9.3.5 Training Areas on the Islands of Molokai and Maui

Molokai Training Support Facility (MTSF), Island of Molokai

Construction/Operational Impacts. Given the extent of grading that is evident in photographs from 1941 to 1948, and the results of monitoring of UST tank removal (Dega 1997), the MTSF APE is evaluated to have low potential for archaeological and traditional cultural resources. With the proposed action, no effects on cultural resources are expected during either construction or operations and no mitigation is required. There would be no impacts associated with the No Action Alternative; no mitigation is required.

Kalaupapa Airport, Island of Molokai

Operational Impacts. Determination of effects related to increased use of Kalaupapa Airport by the H-1 squadron is part of ongoing NHPA Section 106 consultations, and will be documented in the PA. At present, and based on input from consulting parties, the Marine Corps is contemplating various levels of aviation training use—from that analyzed throughout this FEIS under the proposed action to reduced use (including no new use) at Kalaupapa Airport. For these reasons, this section describes not only the potential environmental impacts on cultural resources at Kalaupapa, but also describes the effects of reduced use at Kalaupapa (i.e., increased use at other airports) and the potential effects on other airport environments.

Regarding potential impacts on archaeological resources, the Kalaupapa Airport runway encompasses the northern edge of Site 1897, a complex of surface residential, agricultural, and possible burial structures; it is part of the expansive Kalaupapa Field System. There is little potential for finding evidence of subsurface cultural deposits related to these features. With the proposed action and No Action Alternative, no effects on archaeological resources are expected.

Depending upon the outcome of the NHPA Section 106 consultation, aviation training by the Marine Corps at Kalaupapa Airport could range from that described throughout this FEIS to no new use. With no new aviation training by the Marine Corps at Kalaupapa Airport, the proposed 1,388 H-1 night training (NVD) operations would be reallocated to other DoD or

State airports suitable for night training. Table 4-56 shows the airports and associated operations that are proposed to accommodate night training operations should a decision not to use Kalaupapa Airport as part of the proposed action be rendered. Supporting details are presented in Appendix C-3. In the case of Bradshaw Airfield at PTA and the airfield at PMRF, conduct of NVD operations could only be accomplished if the H-1 aircraft were deployed to those installations for other training activities, as both airports are outside the 65-nm radius from MCB Hawaii Kaneohe Bay (aircraft could not depart from MCB Hawaii Kaneohe Bay, conduct the training, and return without refueling, and would not have sufficient time to return to MCAS Hawaii Kaneohe Bay after the training before the airfield closed at midnight.).

Table 4-56. Contemplated Reallocation of H-1 NVD Operations from Kalaupapa Airport [1]

Airport	Contemplated Reallocation of H-1 NVD Operations from Kalaupapa Airport	% Change to NVD Operations Due to Contemplated Reallocation	Equivalent NVD Training Hours per Year [2]
Dillingham Airport	555	17.7%	14
PTA	555	3.2%	14
PMRF	278	19.7%	7
TOTAL	1,388	-	35

Notes
1 Relative change in NVD operations are compared to operations occurring during similar period (limited to period when NVD operations can occur). See Appendix C-3 for supporting details.
2 Number of hours based on two aircraft operating at a time and completing a total of 40 NVD operations in 1 hour. In the case of Dillingham, 14 hours = 555 operations x (1 hour/40 operations). See Appendix C-3 for supporting details.

The additional 555 operations at Dillingham and Bradshaw (PTA) airports would likely represent one hour of NVD training (approximately 7PM to 10:30PM) each day over approximately 14 days per year at each of the two airports.[40] At PMRF, the additional 278 operations would likely represent one hour of NVD training each day over approximately 7 days per year.

The increased use at the airports listed in Table 4-56 would not significantly impact the resources/issues evaluated in this FEIS, e.g., soil, noise, air quality. With the exception of noise, no additional localized impacts would occur from the additional operations at these

[40] 40 operations / hour-visit = 20 operations / hour-pilot x 2 pilots / visit.
1,388 operations x 1 hour-visit / 40 operations = 34.7 hour-visits

existing airports. The affect on noise levels, considering the number of operations proposed in Table 4-56, would not be appreciable as such increases are unlikely to increase the DNL more than 2 dB and changes up to 3 dB are generally not detected by the human ear.

Determination of effects and measures to resolve any adverse effects related to the increased operations at Kalaupapa Airport will be made in the context of the NHPA Section 106 consultations and will be documented in the PA and in the Record of Decision for this EIS. Should the outcome of the NHPA Section 106 consultation process differ substantially from the range of outcomes contemplated in this analysis, additional NEPA documentation will be prepared by the DoN.

Hawaii Army National Guard Facility (HIARNG), Island of Maui

Operational Impacts. LZ Armory is located adjacent to Site 4164, the remains of a portion of NAS Puunene (concrete foundations and standing structures of the main base area). Rotor downwash is not anticipated to have an adverse impact on Site 4164. There would be no effects on cultural resources with the proposed action or the No Action Alternative. No mitigation is required.

4.9.3.6 Additional Archaeological Surveys

The APEs of the LZs, DZs, and other facilities at the Army training areas on Oahu and at PTA have been surveyed for archaeological resources at various levels. For many, surveys have been completed but only for surface features. Others have been partially surveyed, e.g., not the entire APE. In one case, only an aerial survey has been carried out. In other cases, no archaeological surveys have been conducted. It is noted that construction is not proposed at any of these LZs, but impacts are possible from MV-22 downwash within the APE, depending on the location and depth of cultural resources, if any are present.

Table 4-57 and Table 4-58 list LZs, DZs, and other facilities that require additional archaeological surveys to allow their use by MV-22 aircraft at Army training areas on Oahu and at PTA, respectively.[41] The tables summarize survey completeness, sites found, and potential for finding additional archaeological resources. Additional archaeological surveys are required to determine if additional resources (other than those identified in this evaluation) are present within the APE with the potential to be affected by aircraft downwash.

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[41] The AH-1/UH-1 aircraft are similar to Army's UH-60 aircraft using the training areas. The AH-1/UH-1 create a downwash that is smaller than the MV-22.

At KTA, prior to allowing MV-22 training, additional archaeological surveys are needed within the APE at two LZs, Kahuku Split Rock and X-Strip, which have only been partially surveyed. At KLOA, surveys are needed at three LZs where no surveys occurred (Elephant's Foot, Nixon, and Red) and two LZs where partial surveys were done (Black and Non Stop). No surveys are needed at SBER, where there is little or no probability of finding additional surface features. No surveys are required at DMR because no construction (ground disturbance) is planned, and subsurface features are likely to be located under paving.

Table 4-57. Additional Archaeological Surveys at Army Training Areas on Oahu

APE – LZs	Survey Completeness	Sites Found within APE	Potential for Additional Surface/Subsurface Resources
KTA			
Kahuku Split Rock	Partial	None	Yes/Yes
X-Strip	Partial	None	Yes/Yes
KLOA			
Black	Partial	None	Yes/Yes
Elephant's Foot	None	Unknown	Yes/Yes
Nixon	None	Unknown	Yes/Yes
Non Stop	Partial	None	Yes/Yes
Red	None	None	Yes/Yes

Table 4-58. Additional Archaeological Surveys at PTA

APE – LZs	Survey Completeness	Sites Found within APE	Potential for Additional Surface/Subsurface Resources
PTA – Main Area			
Brad	Unknown	None	Yes/No
DZ Fisher	Complete/surface only	None	Yes/No
FARP 12A	Partial	None	Yes/No
FARP 17	Partial	None	Yes/No
FARP 18	Aerial survey only	None	Yes/No
Noble	Partial	None	Yes/No
Yankee	Unknown	None	Yes/No

Table 4-58. Additional Archaeological Surveys at PTA

APE – LZs	Survey Completeness	Sites Found within APE	Potential for Additional Surface/Subsurface Resources
PTA - Keamuku			
Albatross	Complete/surface only	Fence line	Yes/No
Blue Hen	Complete/surface only	Fence line	Yes/No
Buzzard	Complete/surface only	Fence line	Yes/No
Chick	Complete/surface only	None	Yes/No
Finch	Complete/surface only	20855	Yes/No
Gamecock	Complete/surface only	None	Yes/No
Seagull	Complete/surface only	None	Yes/No
Turkey	Complete/surface only	Fence line	Yes/No

At the PTA LZs, both in the main area and Keamuku parcel, there is no potential for subsurface deposits. This is particularly true in the main area, which has little or no soil. The LZs listed in this table are those with potential for additional surface archaeological resources within the APE. Those with no potential do not require additional surveys.

4.10 SAFETY AND ENVIRONMENTAL HEALTH

4.10.1 INTRODUCTION

This section describes natural and man-made hazards that can affect safety and environmental health. To minimize repetition, this section builds on the hazard discussions in Section 3.10 and Section 4.8 and limits background information to hazards encountered in the ROIs of the landing zones. The following are addressed in this section: natural hazards (flood, tsunami, and seismic); hazardous materials and waste; aviation safety (airfield safety, BASH, and wildfire risks), and ordnance safety. The ROI for these issues is site specific, where the proposed construction and aviation activities would occur.

4.10.2 AFFECTED ENVIRONMENT

4.10.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

Natural Hazards

Flood Hazard. MCTAB falls within multiple flood zones. Three of the four landing zones proposed for improvements are in Zone X, where flood hazards are determined to be outside the 0.2 percent annual chance floodplain (500-year flood). The Federal Emergency

Management Agency (FEMA) considers flood risk in Zone X to be low to moderate. The fourth landing zone, Owl, is located in Zone AE with a Coastal Base Flood Elevation of 13 ft (4.0 m). Zone AE is considered a high risk flood area and is associated with a flood that has a one percent annual chance of being equaled or exceeded in any given year (100-year flood), i.e., the area has a one percent chance of flooding every year.[42] Zone AE areas are where base flood elevations (elevations to which the water surface would rise during a flood) have been determined. See Figure 2-8 for locations of the LZs.

Tsunami Hazard. None of the MCTAB landing zones is within a tsunami evacuation zone.[43]

Seismic Hazard. The island of Oahu is subject to earthquake activity. The most recent earthquakes occurred offshore in 2010 and 2011. Earthquake loading data is provided in UFC 3-301-01, Structural Engineering with Change 2, dated January 31, 2011.

Hazardous Materials and Waste

The management of hazardous waste at MCTAB would follow the responsibilities, requirements, and procedures described in the MCB Hawaii Kaneohe Bay Hazardous Waste Management Plan. All hazardous materials and waste are managed in accordance with applicable laws and regulations.

MCTAB has 17 Installation Restoration Program (IRP) sites. Two of the sites, the Base Landfill and World War II Dump, are located to the north and west of LZ Noni and LZ Owl, respectively. Land use controls are currently in effect at these two locations. The remaining IRP sites have either been closed in place or do not require further action. Based on discussions with the MCB Hawaii Environmental Restorations Program Manager, all underground and above-ground storage tanks have been removed or closed in place. No IRP sites or storage tanks are present around the LZs proposed for improvements.

Aviation Safety

Airfield Safety. At MCTAB (Figure 2-8), LZs are either paved or unprepared areas, such as open grass fields, which may contain one or more landing points (LP). An LP is a specific site or point for an individual aircraft to land on. Unprepared LZs provide real-world training

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42 http://www.fema.gov/plan/prevent/fhm/fq_genhm.shtm#hm1, accessed 19 May 2011.

43 Tsunami evacuation zones on the island of Oahu are defined by the State Department of Civil Defense, City and county of Honolulu Department of Emergency Management, State Department of Land and Natural resources, State Office of Planning GIS Program, and University of Hawaii Pacific Disaster Center. Evacuation zones and recommended actions are based on estimated inundation limits using available historic data.

environments that can be expected when squadrons are deployed. While an LZ may not have specific safety zones, such as those associated with airfields, the DOD and its services, as well as the FAA, have procedures for safe aviation operations when using LZs.

Bird Aircraft Strike Hazard (BASH). At MCTAB, BASH risk is managed through compliance with Marine Corps aviation safety procedures, including air crew SOPs to avoid high-hazard situations and to aid in determining the need to either alter or discontinue operations.

Wildland Fires

As described in Section 4.8.2, wildland fire management and response protocols are contained in Base Order 3302.1. These protocols are incorporated into SOPs for Marine Corps training areas. MCTAB has a cooperative agreement with the Honolulu Fire Department for response to fires at the installation.

Section 4.8.2 also describes the MV-22's exhaust deflector system designed to reduce heating of the ground below the aircraft, as well as operational measures to further minimize the already remote risk of fire.

Ordnance Safety

There are no Explosive Safety Quantity Distance (ESQD) arcs at MCTAB. No ordnance is stored at this training facility.

4.10.2.2 Army Training Areas on the Island of Oahu

Natural Hazards

Flood Hazard. KTA, KLOA, and SBER are all located in Zone D, where flood hazards are undetermined but possible. At DMR, the FEMA study area did not extend over the entire reservation. The northeastern corner is in the one percent annual chance flood plain (100-year flood) (FEMA 2000), but the remaining area is unmapped. By comparing elevations on the unmapped portion of the reservation to the areas that were mapped, it appears that the one percent annual chance flood plain (100-year flood) extends inland from the shoreline to about the 15- to 20-ft (4.6- to 6.1-m) elevation contour. Thus, much of the flat-lying area of DMR may be effectively within an area subject to a 100-year return period for flooding (Army HQ 2008b).

Tsunami Hazard. The flight line at DMR is located within the tsunami evacuation zone.[44] None of the other Army training areas on Oahu proposed for use by the VMM and HMLA squadrons is in a tsunami evacuation zone.

Seismic Hazard. The island of Oahu is subject to earthquake activity. The most recent earthquakes occurred offshore in 2010 and 2011. Earthquake loading data is provided in UFC 3-301-01, Structural Engineering with Change 2, dated January 31, 2011.

Hazardous Materials and Waste

SOPs for the proper management of hazardous waste and regulated non-hazardous waste during training events at off-site locations, away from MCB Hawaii Kaneohe Bay, are described in the base's Hazardous Waste Management Plan. These SOPs apply to all units and activities at the base that deploy to non-MCB Hawaii installations or training areas, and that generate or may potentially generate hazardous waste or regulated non-hazardous waste while on deployment. In addition, plans and procedures for handling, storing, and disposing of hazardous materials and hazardous waste on USAG-HI installations are in place for all users, who are required to follow the USAG-HI Regulation 200-4 Installation Hazardous Waste Management Plan.

There would be no improvements to the LZs at the Army training areas proposed for use by the Marine Corps squadrons. IRP sites and storage tanks are not present at the existing LZs.

Aviation Safety

Airfield Safety. At Army training areas on Oahu (Figure 2-9), aviation safety regulations and procedures are in place. Airfield safety zones are applicable at DMR; these zones are described in Section 3.10. As described above, while a landing zone may not have specific safety zones, such as those associated with airfields, the DoD and its services, as well as the FAA, have procedures for safe aviation operations when using LZs.

Bird Aircraft Strike Hazard (BASH). USAG-HI implements a BASH prevention program at its airfields, including DMR (see Section 4.8.2). At LZs not located at the airfields, BASH risk is managed through air crew compliance with established Marine Corps aviation safety procedures.

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[44] Kauai County Civil Defense, Map of Kauai Showing Tsunami & Flood Zones. Tsunami evacuation zones for the County of Kauai are based on historical data on tsunamis that hit Hawaii in the east. Maps are presented in the Hawaiian Telecom Yellow Pages 200—2010. The State Department of Civil Defense, in partnership with the University of Hawaii, is currently updating the evacuation maps (the project may take several years).

Wildland Fires

USAG-HI has implemented an Integrated Wildland Fire Management Plan to reduce the frequency of fires and the impacts of training-related fires (see Section 4.8.2). Several existing roads at SBER serve as fire control lines during fire suppression. There are no firebreaks at DMR or KTA, but a number of roads serve as firebreaks during fire suppression. There are no readily definable fire barriers within KLOA.

Fire-fighting readiness is provided by the Army at nearby WAAF, which has a two-company firehouse, crash-fire rescue vehicles, conventional pumpers, and one field firefighting vehicle. In addition, through mutual aid agreements, the City and County of Honolulu Fire Department assists the Army with initial wildfire suppression at DMR, KTA, and KLOA, and immediate Federal Fire Department/Range Control response.

Ordnance Safety

There are no ESQD arcs at the Army training areas on Oahu proposed for use by the Marine Corps squadrons.

4.10.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

Natural Hazards

Flood Hazard. PTA is located in Zone X, where flood hazards are determined to be outside the 0.2 percent annual chance flood plain (500-year flood). FEMA considers flood risk in Zone X to be low to moderate.

Tsunami Hazard. PTA is not in a coastal area and is not within a tsunami evacuation zone.

Seismic Hazard. Earthquake activity is common on the island of Hawaii. Earthquake loading data is provided in UFC 3-301-01, Structural Engineering with Change 2, dated January 31, 2011. In 1975, a magnitude 7.2 earthquake originated west of Kalapana along Hawaii's southeastern coast. The earthquake was followed by a tsunami that killed two people. The earthquake and its related catastrophic events resulted in significant property damage.

Hazardous Materials and Waste

As described above, SOPs for the proper management of hazardous waste and regulated non-hazardous waste during training events are described in MCB Hawaii Kaneohe Bay's Hazardous Waste Management Plan. These SOPs apply to all units and activities at the base that deploy to non-MCB Hawaii installations or training areas. In addition, plans and procedures for handling, storing, and disposing of hazardous materials and hazardous waste on USAG-HI installations and training areas are in place for all users, who are required to follow the USAG-HI Regulation 200-4 Installation Hazardous Waste Management Plan.

Two IRP sites at PTA, Landfills 1 and 2, are currently in long-term management. Both sites are closed and include an exclusionary fence to limit exposure to landfill wastes (USAG-HI 2010a). Based on discussions with the U.S. Army's Military Munitions Program Manager, there are eight USTs and 14 aboveground storage tanks (ASTs) at PTA. Three of the ASTs are not in use. No IRP sites or storage tanks are present in the vicinity of LZs proposed for improvements.

Depleted uranium (DU) was raised as an issue during the scoping process for this EIS and is addressed herein. DU is a processed form of uranium. Uranium is a weakly radioactive heavy metal that occurs naturally in the environment. Rocks, soil, surface, water, air, plants, and animals all contain varying amounts of uranium. DU is the uranium left over from the process that enriches uranium for commercial and military uses. Enrichment is a process where a portion of the most radioactive forms of uranium are removed from naturally occurring uranium. DU is nearly twice as dense as lead, with 40 percent less radioactivity than natural uranium (Army HQ 2008b).

A Baseline Human Health Risk Assessment (BHHRA) was completed to evaluate potential health impacts to persons from exposure to DU resulting from the presence of Davy Crockett spotter round bodies (SRB) found at PTA (Cabrera 2010). According to the assessment, the migration of DU off the military installation is highly unlikely. Studies have shown that DU transport is limited and that it is unlikely to migrate from the impact area under most conditions. Studies have also shown that the small DU fragment size and the environmental conditions at the range serve to prevent migration, including by air. Studies conducted by numerous non-military agencies, including the World Health Organization and the Department of Health and Human Services, have not found credible evidence linking DU to radiation-induced illnesses (Army HQ 2008b).

The risk assessment findings demonstrate that the presence of DU in soil at PTA results in radiological risk that falls well below the U.S. Environmental Protection Agency (EPA) limits for what is considered safe. Therefore, no adverse human health impacts are likely to occur as a result of exposure to uranium present in the soil at PTA (Cabrera 2010).

Aviation Safety

Airfield Safety. As shown in Figure 2-10, an airfield, helipads, DZs, and LZs are present at PTA. Safety zones for Bradshaw airfield and helipads follow safety Army and Air Force safety criteria similar to Navy and Marine Corps criteria described in Section 3.10. The primary surface extends 500 ft (152.4 m) from the centerline of the runway and the clear zone extends 3,000 ft (914.4 m) from the end of the runway (Figure 2-14). Helipads have a primary surface of 300 ft by 300 ft (91.4 m by 91.4 m).

DZs are large cleared areas for aircraft to deliver personnel and equipment by parachute, fast rope, or sling load (external lift operation). Safety areas for drop zones are based on the type of aircraft, the cargo or personnel being dropped (parachuted), and altitude of the drop.

As described above, while an LZ may not have specific safety zones, such as those associated with airfields, the DOD and its services, as well as the FAA, have procedures for safe aviation operations when using LZs.

Bird Aircraft Strike Hazard (BASH). As discussed in Section 4.8.2, no bird strikes have been documented at PTA. USAG-HI implements a BASH prevention program at Bradshaw Army Airfield and contract USDA Wildlife Services for BASH control.

Wildland Fires

An Integrated Wildland Fire Management Plan (IWFMP) establishes specific guidance, procedures and protocols for managing wildland fires on Army training lands (25th ID[L] 2006). Fire management areas have been designated at PTA and Keamuku. The ordnance impact area is not covered in the plan because prevention activities are not possible and resources at risk in the existing impact area are largely unknown. Fire management measures include firebreaks and fuels modification by removing and /or modifying an area of flammable vegetation by changing the vegetation type. The PTA Fire Department is responsible for ensuring that wildland fire responses are in accordance with the IWFMP. Other local fire cooperators include the Hawaii County Fire Department, National Park Service, State Civil Defense, Hawaii National Guard, and State Division of Forestry and Wildlife for mutual aid support between agencies (Army HQ 2008b).

Ordnance Safety

Ordnance for training is temporarily kept at ammunition storage areas at PTA. Temporary storage of ordnance complies with applicable procedures and restrictions. The west end of the Bradshaw Army Airfield runway, designated as a hazardous cargo pad for loading and unloading of munitions, has a required ESQD arc of 1,450-ft (442.0 m). The arc is only active when ordnance is present. According to Army Regulation 95-2 (Army HQ 2008a), only operational personnel may be within the ESQD arc while hazardous cargo is present at

Bradshaw Army Airfield. Aircraft may be parked within the ESQD arc but may not be operating. The Alpha helicopter landing pads are within the ESQD arc.

4.10.2.4 Pacific Missile Range Facility (PMRF), Island of Kauai

Natural Hazards

Flood Hazard. The airfield is primarily in flood Zone AE, with a Coastal Base Flood Elevation of 14 ft (4.3 m). The shoreline and western fringe of the airfield is designated Zone VE, a coastal flood zone with velocity hazard (wave action) and a Coastal Base Flood Elevation of 16 and 17 ft (4.9 to 5.2 m).[45] Zones AE and VE are within the one percent annual chance flood plain (100-year flood) where FEMA considers risk for flooding high. Flood zones are shown on Figure 4-7.

Extended periods of heavy rainfall have resulted in minor flooding of localized, low-lying areas of PMRF (CNRH 2010). However, the primary flood hazard at PMRF is from overflow of the drainage ditches that drain the Mana Plain. PMRF personnel (Zenger, 2001 and 2004) noted that there was only one significant flood event at PMRF during the past 20 years, during which Nohili Road flooded near the Kawaiele drainage channel discharge to the south of the airfield (CNRH 2004).

Tsunami Hazards. PMRF is entirely within a tsunami evacuation zone.[46]

Seismic Hazard. The seismic threat at PMRF is considered low by the U.S. Geological Survey. Earthquake loading data is provided in UFC 3-301-01, Structural Engineering with Change 2, dated January 31, 2011.

Hazardous Materials and Waste

SOPs for the proper management of hazardous waste and regulated non-hazardous waste during training events at off-site locations, away from MCB Hawaii Kaneohe Bay, are described in the base's Hazardous Waste Management Plan. In addition, procedures for handling, storing, and disposing of hazardous materials and waste at PMRF comply with the Navy's Consolidated Hazardous Materials Reutilization and Inventory Management Program

[45] FIRM. Nov 26, 2010. Map Number 1500020120F , Kauai County, Hawaii. Panel 120 of 500.

[46] Kauai County Civil Defense, Map of Kauai Showing Tsunami & Flood Zones. Tsunami evacuation zones for the County of Kauai are based on historical data on tsunamis that hit Hawaii in the past. Maps are presented in the Hawaiian Telecom Yellow Pages 200—2010. The State Department of Civil Defense, in partnership with the University of Hawaii, is currently updating the evacuation maps (the project may take several years).

(CHRIMP). All hazardous materials and waste are managed in accordance with existing applicable laws and regulations.

PMRF has two accumulation points on base for hazardous wastes: Building 392 and Building 419. Building 392 accumulates all base waste except for OTTO (torpedo) fuel, a liquid monopropellant. Building 419 is the torpedo repair shop (Navy 2008a).

IRP sites and storage tanks are not present at the PMRF runway.

Aviation Safety

Airfield Safety. As shown in Figure 2-11, an airfield, helipads, and LZs are present at PMRF. Safety zones for airfields and helipads are described in Section 3.10. All aircraft using PMRF are subject to control of the tower.

Bird Aircraft Strike Hazard (BASH). Procedures in PMRF Instruction 5090.7A: BASH Plan are designed to minimize the risk of air strikes. PMRF contracts USDA Wildlife Services for BASH control. See Section 4.8.2 for specific management actions.

Wildland Fires

According to the PMRF INRMP (CNRH 2010), no wildland fires have been recorded at PMRF. The Base Operations Support (BOS)-contracted fire department responds to fires at the range.

Ordnance Safety

At PMRF, ESQD arcs are generated by launch pads, the Kamokala Magazine ordnance storage area, the Interim Ordnance Handling Pad, and the Missile Assembly/Test Buildings 573 and 685. A 1,250-foot ESQD Red Label Area, to handle incoming and outgoing ordnance items, is centered on the airfield taxiway. A soft pad in the Red Label recovery area is used by helicopters for setting down targets and weapons recovered from the range. The 800-ft (152-meter) ESQD surrounding the soft pad falls totally within the Red Label ESQD area. ESQD arcs at PMRF are shown in Figure 4-7.

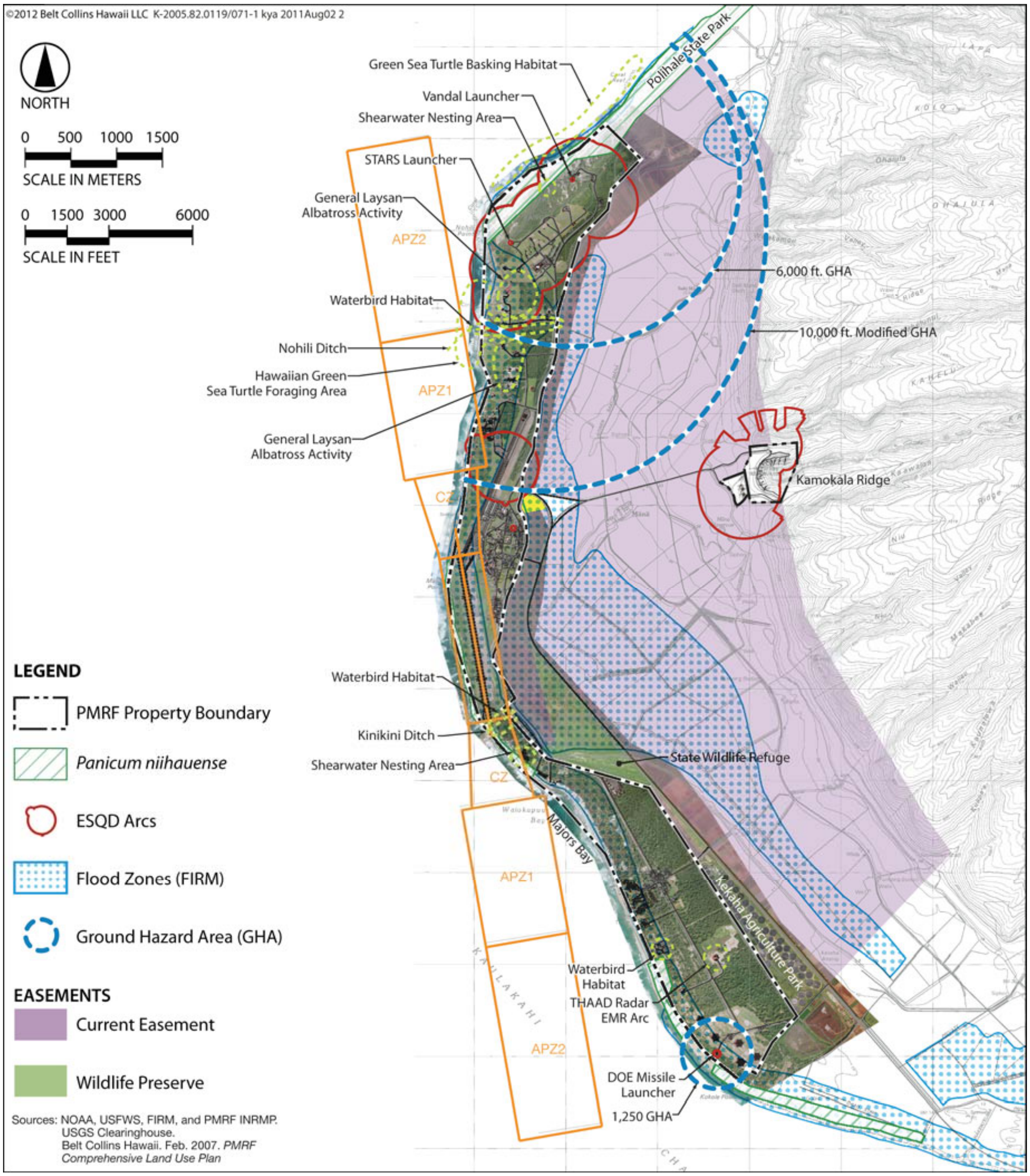

Figure 4-7. PMRF Main Base Constraints Map

4.10.2.5 Training Areas on the Islands of Molokai and Maui

Natural Hazards

Flood Hazard. MTSF, Kalaupapa Airfield, and the HIARNG Facility are located in Zone X, areas determined to be outside the 0.2% annual chance flood plain (500-year flood). FEMA considers flood risk in Zone X to be low to moderate.

Tsunami Hazard. Kalaupapa Airfield is within the tsunami evacuation zone. Neither MTSF nor the HIARNG Facility is within a tsunami evacuation zone.[47]

Seismic Hazard. The islands of Molokai and Maui are subject to earthquake activity. Earthquake loading data is provided in UFC 3-301-01, Structural Engineering with Change 2, dated January 31, 2011.

Hazardous Materials and Waste

SOPs for the proper management of hazardous waste and regulated non-hazardous waste during training events at off-site locations, away from MCB Hawaii Kaneohe Bay, are described in the base's Hazardous Waste Management Plan. All hazardous materials and waste are managed in accordance with existing applicable laws and regulations.

MTSF has two IRP sites: "Dangerous" Sign Area and Paint Pit. These sites are located in the south portion of the property, away from the existing helicopter pad or other areas to be improved. The "Dangerous" Sign Area site was closed in 2000; the Paint Pit site is in the process of being closed. Based on discussions with the MCB Hawaii Environmental Restorations Program Manager, all underground and above ground storage tanks have been removed.

IRP sites and storage tanks are not present at the Kalaupapa Airport runway or the HIARNG LZ.

[47] Tsunami evacuation zones for the County of Maui (including the island of Molokai) are based on historical data on tsunamis that hit Hawaii in the past and maps are presented in the Hawaiian Telcom Yellow Pages, 2009-2010. The State Department of Civil Defense, in partnership with the University of Hawaii, is currently updating the evacuation maps (the project may take several years).

Aviation Safety

Airfield Safety. The airfield at Kalaupapa and the helipad at the HIARNG Facility have safety zones, as described in Section 3.10. MTSF is inactive and not currently used in support of aviation activities.

Bird Aircraft Strike Hazard (BASH). BASH risks are managed through air crew compliance with established Marine Corps aviation safety procedures.

Wildland Fires

The Maui County Department of Fire and Public Safety is responsible for responding to fires at MTSF and HIARNG. Kalaupapa is served by a fire brigade.

Ordnance Safety

No ESQD arcs exist at MTSF, Kalaupapa Airfield, or the HIARNG facility.

4.10.3 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

The proposed action (Alternative A or B) would not increase risks to public health and safety associated with natural and man-made hazards. No habitable structures are proposed. Construction at MCTAB (LZ Owl) would occur within the one percent annual chance flood plain (100-year flood). EO 11988, Floodplain Management, applies to construction within the one percent annual chance flood plain (100-year flood). Construction would be limited to upgrading an existing LZ.

Projects at MCTAB, PTA, and the MTSF would be designed and constructed in consideration of existing conditions, applicable regulations, and DoD requirements. Improvements would carried out in accordance with site-specific geotechnical and structural engineering investigations, and would comply with the seismic design criteria requirements provided in the International Building Code, UFC 1-200-01, General Building Requirements, UFC 3-301-01, Structural Engineering, and UFC 3-310-04 Seismic Design for Buildings. No mitigation is required.

No construction is proposed at the Army training areas on Oahu, PMRF, Kalaupapa Airport, or the HIARNG Facility.

With the No Action Alternative, no construction is proposed and no impacts would occur. No mitigation is required.

Operational Impacts

The proposed action (Alternative A or B) would not increase risks to public health and safety associated with natural or man-made hazards. Proposed training activities would not be subject to unusual or substantive risks associated with natural or man-made hazards. Existing procedures for emergency preparedness, hazardous waste and regulated non-hazardous waste management, airfield and helipad safety, BASH control, wildland fire prevention, and ordnance safety would continue to be implemented. No additional mitigation is required.

DU is confined to the impact area at PTA and has not been detected outside of the impact area. None of the LZs or other facilities proposed for use by the squadrons are within the impact area. Because the impact area has restricted access (Army HQ 2008b), and DU is unlikely to migrate outside the impact area, no exposure and no impacts would occur.

Under the No Action Alternative, no changes and, therefore, no impacts would occur. No mitigation is required.

4.11 SOCIOECONOMICS

4.11.1 INTRODUCTION

Section 3.11.1 describes the factors used in evaluating socioeconomic impacts. This section evaluates how use of proposed training areas by the VMM and HMLA squadrons would affect or contribute to changes in these factors (demographics, the housing market, the economy [employment and income], community organization, public facilities, and public safety and health services). The ROI considered for socioeconomic impacts consists of the surrounding civilian communities immediately adjacent to the training areas. Surrounding civilian communities are described using U.S. Census geographical references.[48]

Use of the proposed training areas by the VMM and HMLA squadrons would not involve assignment of additional personnel at these areas. Training at these facilities would involve minimal interaction with the surrounding communities. For these reasons, demographics are described in this section primarily to address Environmental Justice issues. Public facilities are recognized but would not be used.

[48] Census geography for 2010 differs in some cases from Census 2000. References in this document to Census Tracts identify tracts using their Census 2000 labels. Unless information about the new geography is provided,, readers can treat 2010 tracts as having the same boundary and numbering as in 2000.

4.11.2 AFFECTED ENVIRONMENT

4.11.2.1 Marine Corps Training Area Bellows (MCTAB), Island of Oahu

MCTAB currently functions as a Marine Corps training area, adjacent to military and civilian recreational sites located along the shore. Bellows AFS provides campgrounds, picnic sites, and other facilities for use by DoD active duty and retired personnel. The beach fronting MCTAB is open to the public on weekends and holidays. Access is controlled at both the base entrance and the entry to the military recreation area. The ROI for MCTAB includes the Census Defined Places (CDPs) of Waimanalo and Waimanalo Beach. Waimanalo and Waimanalo Beach include Hawaiian Homestead[49] lands, other suburban residential areas, and farms. MCTAB's 2010 resident population was only 19 persons. The Waimanalo communities had a combined population of 9,932. Table 4-59 shows that little population growth in Waimanalo Beach has occurred, but population increase has been faster than the state average in upland Waimanalo since 2000. Table 4-60 indicates that these communities include higher percentages of minority (Native Hawaiian and Other Pacific Islander) populations when compared to the state's total population.

Table 4-59. Population Growth for Selected Communities on Oahu and Hawaii Island

	State of Hawaii	Waimanalo CDP	Waimanalo Beach CDP	Upland S. Kohala (CT 217.02)	N. Kohala (CT 218)	Kahuku Area (CT 101)	Waialua/ Mokuleia (CT 99.01)	Wheeler (CT 90)	Wahiawa Mauka (Ct 92)
Total Population									
1990 Census	1,108,229	3,508	4,185	NA	4,291	6,909	5,792	2,600	7,963
2000 Census	1,211,537	3,664	4,271	7,116	6,038	7,487	5,731	2,829	6,962
2005 to 2009 ACS	1,280,241	3,512	4,225	9,205	5,161	7,398	5,913	2,900	6,271
2010 Census	1,360,301	5,451	4,481	9,540	6,322	7,881	5,986	1,634	7,963
Average Annual Rate of Change									
1990 to 2000	0.9%	0.4%	0.2%	NA	3.5%	0.8%	-0.1%	0.8%	-1.3%
2000 to 2010	1.2%	4.1%	0.5%	3.0%	0.5%	0.5%	0.4%	-5.3%	1.4%

[49] These are lands leased by the State Department of Hawaiian Home Lands (DHHL) to qualified Native Hawaiian beneficiaries under a program authorized by Congress under several Public Laws (PL) including: P.L. 99-557, P.L. 105-21, and P.L. 102-398.

Two State Department of Education (DOE) schools are in Waimanalo: Waimanalo Elementary and Intermediate and Blanche Pope Elementary. They are within the Kailua High School district complex. Recreation facilities in Waimanalo include beach parks and a district park with sports fields, as well as the beach at MCTAB.

The City provides police, fire, and emergency services. An Emergency Medical Service unit is located at the Waimanalo Fire Station. Health services are provided by Waimanalo Health Center. The nearest hospital is Castle Medical Center in Kailua.[50]

Table 4-60. Indicators of Minority or Low Income Status for Selected Communities on Oahu and Hawaii Island

	State of Hawaii	Waimanalo CDP	Waimanalo Beach CDP	Upland S. Kohala (CT 217.02)	N. Kohala (CT 218)	Kahuku Area (CT 101)	Waialua/ Mokuleia (CT 99.01)	Wheeler (CT 90)	Wahiawa Mauka (CT 92)
Population									
Total Population									
2010	1,360,301	5,451	4,481	9,540	6,322	7,881	5,986	1,634	7,963
2005 to 2009 (ACS)	1,280,241	3,512	4,225	9,205	5,161	7,398	5,913	2,900	6,271
Age Groups (ACS)									
0–17	22.6%	29.2%	23.5%	28.8%	28.6%	25.4%	19%	42.0%	21.4%
18–64	63.3%	56.9%	60.8%	60.2%	60.9%	63.3%	69%	58.0%	56.4%
65 and up	14.1%	13.9%	15.8%	11.0%	10.5%	11.3%	13%	0.0%	22.2%
Median Age, in years (ACS)	37.5	32.4	39.2	32.3	38.7	33.0	37.4	22.9	44.6
Low Income Indicators (ACS)									
Share of Population in Poverty	9.4%	9.7%	6.5%	2.9%	6.1%	11.7%	7.2%	8.7%	4.4%
Share of Age Group in Poverty									
0–17	11.8%	11.8%	11.8%	4.2%	4.4%	9.1%	2%	12.5%	3.0%
18–64	8.9%	10.0%	5.6%	2.2%	5.9%	13.6%	10%	6.0%	3.7%
65 and up	7.8%	4.5%	2.3%	3.2%	11.5%	6.7%	2%	—	7.4%

50 Public services are listed for MCTAB and for other training areas to help describe surrounding communities. Marines are not expected to use these services or facilities in the course of training missions. However, civilian first responders may be available to aid military personnel in case of fire or other emergency.

Table 4-60. Indicators of Minority or Low Income Status for Selected Communities on Oahu and Hawaii Island

	State of Hawaii	Waimanalo CDP	Waimanalo Beach CDP	Upland S. Kohala (CT 217.02)	N. Kohala (CT 218)	Kahuku Area (CT 101)	Waialua/ Mokuleia (CT 99.01)	Wheeler (CT 90)	Wahiawa Mauka (CT 92)
Median Household Income	$64,661	$50,000	$72,500	$76,850	$61,234	$59,879	$71,321	$48,659	$68,523
As % of State Median	100%	77%	112%	119%	95%	93%	110%	75%	106%
Minority Indicators (ACS)									
Race[1]									
White	42.7%	44.9%	35.1%	57%	42.7%	65.3%	55.4%	73.5%	31.8%
Black or African American	3.8%	4.4%	0.8%	2%	3.8%	0.9%	2.9%	19.1%	1.4%
American Indian and Alaska Native	2.3%	3.1%	1.9%	3%	2.3%	3.7%	1.6%	11.5%	1.6%
Asian	55.0%	51.0%	38.0%	36%	55.0%	29.6%	50.3%	8.8%	78.6%
Native Hawaiian and Other Pacific Islander	23.1%	60.9%	81.5%	27%	23.1%	29.4%	21.2%	3.5%	28.4%
Some other race	2.5%	3.7%	1.8%	2%	2.5%	1.0%	2.6%	4.1%	0.9%
Total races recorded as % of population	129.5%	168.1%	159.1%	127%	129.5%	129.9%	134.0%	120.5%	142.6%
Hispanic or Latino	8.6%	16.5%	8.8%	13.8%	8.6%	8.1%	12.4%	19.0%	7.0%

Notes:

Census Tract numbers refer to 2000 tracts. Tract identifiers have changed in some cases from 2000 (and the recent ACS) to the 2010 Census. The American Community Survey information shown here provides a basis for comparing the distribution of races and incomes in different communities to the statewide distribution in Hawaii. The nation as a whole has a much larger share of Whites in the population (76.4%) and small groups of Asians (5.0%) or Native Hawaiians and Other Pacific Islanders (0.3%) when compared to Hawaii numbers. Also, the total number of races recorded nationally – an indicator of multiracial status – is 102.5%, much lower than for Hawaii geographies. The share of Blacks (13.2%) and Hispanics (15.1%) in the national population, on the other hand, is higher than in Hawaii.

1 Federal definition allows for more than one race to be recorded.

4.11.2.2 Army Training Areas on the Island of Oahu

The ROI for Army training areas on Oahu proposed for use by the squadrons are as follows:

- SBER: Census Tract (CT) 90 and CT 92 (the eastern half of Wahiawa). [51]
- KTA and KLOA: CT 101, including Kahuku, Turtle Bay, and Sunset Beach.
- DMR: CT 99.01 (2000 tracts) or 99.04 (2010 tract list), including Waialua and Mokuleia.

CT areas relative to Army Training Areas are shown on Figure H-1 in Appendix H.

Wheeler Army Airfield is the headquarters for USAG-HI, as well as a military airfield and housing area. It has housed both Navy and Army families. Its recent decrease in population may reflect ongoing rehabilitation and construction of new housing for both services. It is served by elementary and middle schools located on base.

Wahiawa, a historic plantation town, was the center for pineapple cultivation on Oahu. This industry has declined, but Wahiawa still serves as the civilian area supporting the Schofield Barracks Army post. The eastern side of Wahiawa (CT 92), which lies north of some of the SBER landing zones, largely includes single-family homes. The population declined from 1990 to 2000, but has recently increased again. The population includes Native Hawaiians (28.4% in the American Community Survey [ACS] data) and Filipinos (within the 78.6% Asian group in the ACS data). The student population at Iliahi Elementary school for school year 2009/2010 was classified as 29.2 percent Native Hawaiian and 24.4 percent Filipino. (DOE 2010) CT 92 also includes Leilehua High School. The regional middle school, Wahiawa Middle School, and a district park lie just west of the area. The town of Wahiawa is served by a fire station and the District 2 police station. Wahiawa has a local hospital and an emergency medical service unit.

The Kahuku and Waialua/Mokuleia areas have seen little population change in recent decades. Most of Kahuku's population (81.5%) is identified as Native Hawaiian or Other Pacific Islander. The racial composition of the Waialua/Mokuleia area is closer to the statewide average. DOE schools on the North Shore include Kahuku and Sunset Beach Elementary Schools and Kahuku High and Intermediate School in CT 101, and Waialua Elementary School and Waialua High and Intermediate School in CT 99.04. These areas form the endpoints of Oahu's famous North Shore ocean recreation area. Beach parks are located at several points along the coastline. Fire stations are located in Kahuku and Waialua. Police services cover the area from stations in Kaneohe and Wahiawa. Emergency Medical Service

[51] These tract numbers are for 2000. For 2010, tract 90 was divided into two parts, separating WAAF (still numbered as tract 90) from SBER (new tract 9607). The new tract has no resident population.

units are based at Kahuku Hospital and the Waialua Fire Station. Community hospitals serving the region are located in Kahuku and Wahiawa.

4.11.2.3 Pohakuloa Training Area (PTA), Island of Hawaii

PTA occupies part of upland South Kohala, along with the town of Waimea. Immediately adjacent to PTA is Waikii Ranch, a subdivision of residential lots ten or more acres (4 ha) in size. PTA has functioned as a military training area for decades, and it currently supports training for the Army's 2/25th Division's Stryker Brigade and the Marine Corps, as well as joint exercises such as the annual RIMPAC exercise.

The ROI for PTA consists of CT 217.02, which includes the town of Waimea and other upland areas of South Kohala. South Kohala has experienced population growth over the last two decades. From 1990 to 2000, the district grew at an annual rate of 3.7 percent. The coastal area now includes upscale resort residential developments. Waimea has become a center for astronomy as well as ranching. It is home to many professionals working in South Kohala and North Kona.

Hawaii County provides fire, police, and emergency medical services for West Hawaii. A new fire station at Makalei will soon improve the Fire Department's ability to respond to emergency calls in upland areas of West Hawaii. State DOE schools are located in Waikoloa and Waimea. (High schools in Kailua-Kona, Kapaau, and Honokaa can also serve South Kohala students.) Recreation facilities are located in Waimea and at Hapuna State Recreation Area in Kawaihae and at several county beach parks. Medical services are provided by North Hawaii Community Hospital in Waimea.

4.11.2.4 Pacific Missile Range Facility (PMRF), Island of Kauai

West Kauai includes Waimea and Kekaha (former sugar plantation towns) and PMRF. Waimea serves as the access point to Waimea Canyon and Kokee State Park, which are important for Kauai tourism.

The ROI for PMRF consists of CT 409, which includes Kekaha and Waimea. As Table 4-61 shows, the regional population declined during the 1990s, and has only increased slightly since then. The population, summarized in Table 4-62, includes a large Native Hawaiian group (35.2% of the ACS population, as compared to 23.1% statewide).

Table 4-61. Population Growth for Selected Communities on Kauai and Molokai

	State of Hawaii	West Kauai (CT 409)	West Molokai (CT 318.01)	Kalawao County (Kalaupapa)
Total Population				
1990 Census	1,108,229	5,745	2,168	130
2000 Census	1,211,537	5,125	2,569	147
2005 to 2009 ACS	1,280,241	4,651	2,637	78
2010 Census	1,360,301	5,561	2,752	90
Average Annual Rate of Change				
1990 to 2000	0.9%	-1.1%	1.7%	1.2%
2000 to 2010	1.2%	0.8%	0.7%	-4.8%

Table 4-62. Indicators of Minority or Low Income Status for Selected Communities on Kauai and Molokai

	State of Hawaii	West Kauai (CT 409)	West Molokai (CT 318.01)	Kalawao County (Kalaupapa)
Population				
Total Population				
2010	1,360,301	5,561	2,752	90
2005 to 2009 ACS	1,280,241	4,651	2,637	78
Age Groups (ACS)				
0–17	22.6%	21.5%	31.6%	0%
18–64	63.3%	63.1%	57.3%	54%
65 and up	14.1%	15.5%	11.1%	46%
Median Age, in years (ACS)	37.5	40.7	36.6	63.6
Low Income Indicators (ACS)				
Share of Population in Poverty	9.4%	10.2%	21.7%	3.8%
Share of Age Group in Poverty				
0–17	11.8%	8.0%	39.6%	0%

Table 4-62. Indicators of Minority or Low Income Status for Selected Communities on Kauai and Molokai

	State of Hawaii	West Kauai (CT 409)	West Molokai (CT 318.01)	Kalawao County (Kalaupapa)
18–64	8.9%	11.5%	14.7%	0%
65 and up	7.%	7.8%	7.2%	8%
Median Household Income	$64,661	$57,437	$42,100	$52,813
As % of State median	100%	89%	65%	82%
Minority Indicators (ACS)				
Race[1]				
White	42.7%	28.6%	33.6%	45%
Black or African American	3.8%	0.5%	0.3%	0%
American Indian and Alaska Native	2.3%	0.0%	0.2%	12%
Asian	55.0%	48.4%	33.0%	35%
Native Hawaiian and Other Pacific Islander	23.1%	35.2%	68.8%	42%
Some other race	2.5%	0.3%	1.3%	0%
Total races recorded as % of population	129.5%	112.9%	137.9%	1%
Hispanic or Latino	8.6%	7.7%	4.0%	0.0%

Note

The Kalawao County population is small, so distributional analyses – medians and percentage shares – are affected by a very few persons. In any case, the defining fact about this population is that it is composed of Hansen's Disease survivors, their caregivers, and National Park staff.

1 Federal definitions allow for recording more than one race per person.

Public schools are located in Kekaha and Waimea. Waimea Canyon Middle School and Waimea High School serve the region. Recreation facilities include beaches throughout the region and camping at Polihale State Park, northeast of PMRF. A fire station at Waimea serves the west end of Kauai. Regional police service is the responsibility of the County of Kauai. Medical facilities are located at West Kauai Medical Center in Waimea and at Wilcox Memorial Hospital in Lihue. Emergency medical services are provided by American Medical Response in Waimea.

4.11.2.5 Training Areas on Molokai and Maui

West Molokai includes Hawaiian Home Lands, the community of Maunaloa, which once was a plantation town, and the Kaluakoi resort area. Tourism development has been largely unsuccessful in the region. The hotels at Kaluakoi and Maunaloa have been closed. Resort residential homes are located near the coast at Kaluakoi.

The ROI for MTSF consists of the West Molokai CT, identified as CT 318 in 2000, CT 318.01 in 2010. The population appears to be growing slightly.[52] Incomes and employment are low, although farming and other subsistence activities help to support residents. The share of the population in poverty (21.7%) is twice that of the state as a whole. Two-thirds of the population (68.8%) identify as Native Hawaiian or Other Pacific Islanders.

The ROI for Kalaupapa Airport consists of the Kalawao County area, also identified as CT 319. A Hansen's disease colony was established on the Kalaupapa peninsula in the 19th century because of its isolation. The Kalaupapa National Historical Park is administered jointly by the National Park Service and the State Department of Health. It is home to a small number of patients, along with state and federal workers. The population includes a 42 percent share of Native Hawaiians.

Schools in West Molokai include Maunaloa Elementary and Kualapuu Public Conversion Charter School. Both Molokai Intermediate School and Molokai High School are located in Hoolehua. No schools are located in Kalaupapa. Maui County has fire stations in Hoolehua and Kaunakakai. Fire fighting facilities at Molokai Airport (Hoolehua) have been extensively upgraded in recent years. Kalaupapa is served only by a fire brigade. The Molokai police station is located in Kaunakakai. Molokai Hospital provides medical services to most of the island; patients at Kalaupapa largely rely on Honolulu hospitals for medical care. American Medical Response provides ambulance services on Maui and Molokai.

The HIARNG facility on Maui is near the former Puunene airfield (now used as a raceway park). The immediate surrounding area is industrial and agricultural. Within the ROI, no residential communities exist. Agricultural lands separate the industrial area from the residential communities of Maalaea to the west and Kihei to the south. A state prison facility is proposed to be developed in the vicinity.

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[52] The 2000 Census Tract (318) was slightly larger than the 2010 tract (318.01). Further quantification of population growth would demand an analysis of small census block areas.

4.11.3 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

Construction or improvements at MCTAB, PTA, and MTSF would be minor and not affect socioeconomic factors for nearby communities. Construction employment for work at landing zones was included in calculations in Chapter 3, since construction would be covered by a single contract rather than having separate contracts for each landing zone or training area.[53] No impact on socioeconomics associated with the proposed training areas would occur under the proposed action (Alternative A or B) and No Action Alternative, and no mitigation is required. Under No Action, proposed improvements would not be constructed. No impacts would occur; no mitigation is required.

Operational Impacts

No changes to the socioeconomic conditions surrounding the proposed training areas would occur with the proposed action (Alternative A or B) and No Action Alternative. No changes in the number of personnel stationed at the training areas would occur. No mitigation is required.

With respect to EO 12989, Environmental Justice in Minority Populations and Low-Income Populations (11 February 1994), the following communities can be considered as minority or low-income populations when compared to statewide population distributions: Waimanalo and Waimanalo Beach (near MCTAB), West Kauai (PMRF), West Molokai (MTSF), and Kalaupapa (Kalaupapa Airport) (see Table 4-60 and Table 4-62). However, socioeconomic impacts on these populations and communities as a result of proposed activities at these training areas would be minimal or absent.

Hence, while several of the communities identified as within the ROI are minority or low-income populations, no disproportionate impact on minorities or low-income communities would occur, as no significant adverse effects have been identified. No mitigation is required. Similarly, no impacts that could pose a significant threat to the health and well-being of children have been identified. Therefore, no health and safety risks with the potential to disproportionately affect children would occur with the proposed action. This evaluation has been made in accordance with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks (21 April 1997). No mitigation is required.

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[53] The proposed landing zone improvements are consolidated in one MILCON (military construction) project.

Under No Action, the VMM and HMLA squadrons would not train at these training areas. Accordingly, there would be no potential for disproportionate impacts on minorities or low-income communities or disproportionate health and safety impacts to children. No mitigation is required.

4.12 INFRASTRUCTURE

Activities at the training areas would involve improvements to certain existing facilities (LZs) and aviation training by the new squadrons. The training would be transient in nature, not requiring any infrastructure support other than what is currently available at the installations and training areas. Therefore, no significant infrastructure impacts are anticipated under any of the alternatives, and no mitigation is required.

4.13 ENERGY USE

4.13.1 INTRODUCTION

The 2005 Energy Policy Act, the 2007 Energy Independence and Security Act, and various supporting EOs such as 13514 Energy Efficiency and Energy Consumption of October 2009, and EO 13423 Strengthening Federal Environmental Energy and Transportation Management, call for reduction in energy intensity for federal facilities and conservation of energy.

4.13.2 AFFECTED ENVIRONMENT

The training locations are composed of sites (many without facilities with energy use) used as landing zones or for re-fueling.

4.13.3 ENVIRONMENTAL CONSEQUENCES

Construction Impacts

The proposed action would involve minor construction at MCTAB, PTA, and MTSF to improve existing facilities. No significant impact to energy intensity is anticipated and no mitigation is required.

Operational Impacts

Aviation training activities involve the consumption of aviation fuels. Fuel consumption would vary with aircraft type, weights/loads, and flight activities. In general, newer aircraft have more fuel efficient engines than older aircraft. The use of aviation bio-fuels is developing as an energy alternative to petroleum based products and to enhance national energy security. Some European commercial airlines plan to use aviation bio-fuels for regular scheduled flights starting in 2011. The U.S. Air Force has tested aviation bio-fuel use. The Air

Force and Navy are looking to regularly use aviation bio-fuels by FY 2016. There are issues with the high cost, limitation of production sources, and the requirement for overall energy reduction for the production/use of aviation bio-fuels, as compared to petroleum based fuels for the military in the U.S. and overseas. A recent Rand study on bio-fuels conducted for the DoD summarizes aviation bio-fuel use by the military (Rand 2011). The Marine Corps is planning to regularly use aviation biofuels, which have been successfully tested in the MV-22, and analyzed and recommended for use in the H-1.

CHAPTER 5

Cumulative Impacts

Cumulative Impacts

5.1 INTRODUCTION

Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) define cumulative effects as "the impact on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period time."[1]

Direct and indirect impacts are assessed in Chapters 3 and 4. Direct impacts are those that happen immediately upon implementation of the action. Indirect impacts are generally those that may occur later in time or farther away in distance. Chapter 5 addresses cumulative effects of the proposed action in the context of other actions within the region of influence (ROI) and during the planning horizon.

5.2 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE PROJECTS CONSIDERED IN THE CUMULATIVE ANALYSIS

This section summarizes past, present, and reasonably foreseeable future actions in the applicable ROIs for the various resources/issues. Projects or activities were selected because they are either in proximity to the proposed action, similar to the proposed action, large enough to have effects, and/or occurring within the same timeframe. These include other projects/activities at Marine Corps Base (MCB) Hawaii Kaneohe Bay and at the training areas. In the analysis of cumulative impacts at MCB Hawaii Kaneohe Bay, both development projects and training activities are considered. At the training areas, since the proposed construction projects are relatively minor—limited to improving existing landing zones (LZs) at certain facilities—the focus is on identifying aviation operations by others, mainly by the Army, National Guard, and other military services.

5.2.1 MILITARY ACTIONS

Related military actions have a potential to contribute to cumulative impacts, particularly those in the same ROI as the proposed action, occurring within the same time period. Following is a summary of Marine Corps, Army, Navy, Air Force, and National Guard initiatives considered in the cumulative impacts analysis.

[1] 40 CFR 1508.7

FY2011 Aviation Plan (AvPlan)

The U.S. Marine Corps Fiscal Year (FY) 2011 Marine Aviation Plan (AvPlan) (USMC 2010), published in September 2010, is a consolidated action plan that provides an overview of Marine Corps aviation total forces; aviation readiness; and planned organizational, aircraft, and equipment transitions over the next ten years. This document, updated annually, delineates the Marine Corps' overall strategy and schedule for equipment upgrades, potential movement of units, and fielding of new aviation capabilities across the Marine Corps. Specifically, it addresses future plans for all Marine Corps aircraft and squadrons to be based at MCBH Kaneohe Bay. Currently, there are three HMH squadrons of CH-53Ds and one Marine Transport Squadron Detachment (VMR Det) with one C-20G aircraft. In addition to the squadrons and aircraft described in this Environmental Impact Statement (EIS), it is anticipated that there will be one Marine Heavy Helicopter (HMH) squadron of CH-53Es by FY13. VMR Det[2] will continue to be based at MCBH Kaneohe Bay but will transition from C-20G to C-20RA by FY16. Also included in the AvPlan is the future relocation of a VMU (Marine Unmanned Aerial Vehicle) squadron to the state of Hawaii. These transitions were taken into account in the analysis of several resources/issues, including but not limited to land use compatibility, airspace, air quality, and noise, among others.

Grow the Force (GTF or 202K)

In January 2007, the President of the United States, on the recommendation of the Secretary of Defense, announced that the Marine Corps would increase its end strength from approximately 180,000 to 202,000 by 2011. This initiative, known as Grow the Force (GTF or 202K), provides balance to Marine Expeditionary Forces and relieves stress on the active and reserve Marines and their families. The goal is to achieve a 1 to 2 deployment-to-dwell[3] ratio for active forces and a 1 to 4 ratio for the reserves. The decrease in deployment-to-dwell ratio provides adequate time to recover between deployments, additional training to meet combat readiness, and preparation for redeployment. The purpose of GTF is to ensure that Marines are properly prepared and trained for current combat and homeland protection missions and future conflicts.

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2 VMR Det is the Marine Transport Squadron Detachment unit that flies the C-20G. The squadron provides air transport of high priority passengers and cargo between and within a theater of war.

3 Deployment-to-dwell is defined as the ratio of time spent deployed against all time spent in dwell (i.e., not deployed). For example, using the goal of 1:2 deployment-dwell ratio, a Marine who deploys for seven months would earn 14 months of dwell time. (U.S. Marine Corps. July 2007. *Post-Deployment Mobilization Respite Absence (PDMRA).* MARADMIN 448/07)

GTF initiatives that have already been implemented at MCB Hawaii Kaneohe Bay are the introduction of an additional artillery battery (Echo Battery, 2nd Battalion, 12th Marines [2/12 Marines]) and a radio company (Bravo Company, 3D Radio Battalion). The aviation ground support squadron (Marine Wing Support Detachment, MAG-24) arrival would be phased from FY12 and beyond. Adequate living, working, and training facilities would be constructed or existing facilities would be renovated to support the additional ground combat personnel assigned to MCB Hawaii Kaneohe Bay. Base loading (population) projections for the GTF initiative were incorporated in the socioeconomic, traffic, and utilities/infrastructure analyses.

Force Realignment Initiatives

Between Oct 2010 and March 2012, the Marine Corps conducted a Force Structure Review to assess the future structure of the Marine Corps and "right-size" the force relative to the future mission. That review resulted in a decision to reduce the overall size of the Marine Corps from 202,000 to 182,100 by Fiscal Year 2018. The impacts of this reduction in force for specific Marine Corps installations is still being evaluated however, changes in force structure as a result of the Force Structure Review for MCB Hawaii appear to be minimal.

At the same time, ongoing discussions between the U.S. and the Government of Japan relative to the roadmap to reduce the size of the Marine Corps force based in Okinawa, have been ongoing. In September 2010, the Assistant Secretary of the Navy for Energy, Infrastructure and Environment signed a Record of Decision to relocate 10,000 Marines and their dependents from Okinawa to the island of Guam. Since that decision, deliberations by Congress and further negotiations between the U.S. and GOJ have resulted in a change in the proposed realignment of forces within the Pacific. The current proposal would involve relocating approximately 4,000 Marines from Okinawa to Guam; the remaining 6,000 Marines relocating from Okinawa will be based in several locations, including Australia, the mainland U.S., and MCB Hawaii. No final decision has been made regarding the number of Marines that would be based in Hawaii, the type of units, or the timing of that basing.

Hawaii Public/Private Venture Housing Program

MCB Hawaii entered into a Public/Private Venture (PPV) to privatize a portion of family housing on Oahu through year 2054 under the Military Housing Privatization Initiative (MHPI). In 1996, Congress established the MHPI as a tool to help the military improve the quality of life for its service members by improving the condition of their housing. As authorized by the MHPI, the Hawaii PPV Housing Program was established for the Department of the Navy (DoN) and Marine Corps in Hawaii. Housing units continue to be renovated or replaced at MCB Hawaii Kaneohe Bay. This program was considered in the socioeconomic and infrastructure analyses.

Naval Aviation Vision 2032

The Naval Aviation Vision, published in January 2010, provides an overview of aviation for the Navy and Marine Corps through year 2032. Under the Naval Aviation Vision, most of the P-3C aircraft will be replaced by the P-8A, and the SH-60 will be replaced by the MH-60R. Currently, there are three patrol squadrons (VP) of P-3Cs, one special projects patrol squadron (VPU) of P-3C Update, and one anti-submarine helicopter squadron (HSL) of SH-60 based at MCB Hawaii Kaneohe Bay. Consistent with the vision, the P-3C and SH-60 based at MCB Hawaii Kaneohe Bay will be replaced. These aircraft transition plans have been incorporated primarily into the land use compatibility, airspace, air quality, and noise impact analyses.

New P-8A Facilities at MCB Hawaii Kaneohe Bay

A Final EIS for Introduction of the P-8A Multi-Mission Aircraft into the U.S. Naval Fleet was published in November 2008. The Record of Decision (ROD) was signed on December 31, 2008. Included in the aircraft replacement program is a proposal to modify training practices and maintenance support. New training and maintenance facilities are being developed at MCB Hawaii Kaneohe Bay to accommodate the new aircraft, to be located in the vicinity of the Alternative A site for the proposed MV-22 facilities. This project was considered in the analysis of cumulative construction-related impacts at the base, as well as the analysis of noise, airspace, and air quality impacts.

MILCON Projects at MCB Hawaii Kaneohe Bay

Table 5-1 lists Military Construction (MILCON) projects at MCB Hawaii Kaneohe Bay not directly related to the MV-22/H-1 introduction, consisting of facility, infrastructure, and community service improvements to support base operations and personnel. These projects are in response to other initiatives, such as GTF/202K, or address existing facility deficiencies and demands. They were considered primarily in the analysis of cumulative construction impacts relating to soils and drainage (storm water runoff), as well as cumulative impacts on cultural resources.

Table 5-1. MILCON Projects, MCBH Kaneohe Bay

Project Name	Description	Anticipated Timeframe
Bachelor Enlisted Quarters (BEQ)	Construct BEQ at Kaneohe to meet current demands.	FY10
Child Development Center (CDC)	As part of the American Recovery and Reinvestment Act of 2009, expand the existing CDC to meet increased demands for infant and child care at Kaneohe.	FY10
Waterfront Operations Facility	Construct facility to replace the Waterfront Operations deteriorated metal facilities.	FY11
BEQ	Construct BEQs to support new Marines resulting from GTF/202K.	FY11
Air Operations Facility	Construct a new Air Operations Facility to house administrative offices, passenger and cargo terminal. Construct a new Air Rescue Fire Fighting facility and transient aircraft parking apron.	FY12
P-8A Hangar and Training Facilities	Construct new hangar and training facilities for the P-8A.	FY14
Mission Support Facility/Aviation Trainers	Construct a new aviation simulator training center to support MAG-24.	FY14
Consolidated Aid Station	Construct and consolidate units’ aid stations with medical and dental facilities.	FY15
Wastewater Treatment Plant (WWTP) Redundancy and Electrical Upgrade	Upgrade the Base WWTP to provide redundant treatment systems to address State of Hawaii recommendations and for contingency operations in case of failure of critical components.	FY15
Ordnance Storage Magazines	Relocate ordnance storage magazines to address waiver condition on the landfill and road to Ulupau Range.	FY15
Marine Wing Support Detachment (MWSD Headquarters and Support Facilities	Construct and renovate facilities for HQ and support facilities for the MWSD as part of GTF/202K.	FY15
Multi-Purpose Training Complex	Construct facility to support individual and small unit training using simulators.	FY16
Communications and Information Systems Department (CISD) Facilities	Construct facility to consolidate CISD operations.	FY16
Installation Personnel Administration Center	Provide administrative support center for Marine Corps Pacific region.	FY17
Enlisted Dining Facility	Construct replacement facility for aging and deteriorated mess hall.	FY17
3d Marines Regiment Headquarters	Replace aging headquarters facility and consolidate/centralize all Ground Command Elements battalion headquarters.	FY17

Note: Not all of these projects have been cost certified, and fiscal year dates for projects past FY12 will likely change considerably between now and the actual year of award.

MCCS Projects at MCB Hawaii Kaneohe Bay

Projects being planned by Marine Corps Community Services (MCCS) at MCB Hawaii Kaneohe Bay are listed below. MCCS provides morale, welfare, and recreation facilities and services on the base.

- Marina Pier and Wave Attenuator, FY12: construct new docks, floating wave attenuator, boat rinse area with improved drainage, fuel pump and fuel dock; relocated moorings.
- Marina Cove and Salvage Yard, FY12: construct new boat storage, pedestrian bridge, picnic area, and repair of existing ramp.
- Auto Skills Center, FY13: demolish Buildings 1267, 1307, and 1672 and renovate Building 3097; construct new exterior bays and support facility.
- Wiki Wiki Marine Mart, FY13: construct new marine mart and food vendor spaces to replace existing facilities in Building 1090.
- New Car Wash, FY14: construct new car wash (similar in scope and scale to the existing facility at the gas lanes) adjacent to the new gas lanes at the front gate Marine Mart.
- Klipper Recreation Villas and Cart Barn, FY14: construct new villas; relocate cart barn and maintenance facility.
- Marine Corps Exchange (MCX) Annex, Military Clothing, Tailor Shop, and Dry Cleaners, FY15.
- Pyramid Beach Cottage Additions, FY15: construct additional quadraplex cottages (8 units) and triplex cottages (3 units).
- Pyramid Beach Cottage Efficiency Units Building, FY15: construct 16 new efficiency units.
- Addition to Self Storage, FY16: construct addition to be co-located with MILCON for self storage replacement.
- Boat Storage at West Field, FY16: construct new boat storage facility.
- MCCS Warehouse and Lending Locker, FY17: replace Building 1295 with a new warehouse.

Power Plant at MCB Hawaii Kaneohe Bay

The development of an Enhanced Use Lease (EUL) is underway by NAVFAC Hawaii for a bio-diesel fueled power plant sized up to 60 megawatts (MW) at MCB Hawaii Kaneohe Bay. Similar to a power purchase agreement (PPA), the power plant would be contractor owned, operated, and maintained, and would provide electricity at a fixed rate to MCB Hawaii Kaneohe Bay. The purpose of the power plant would be to serve as a rapid-start peaking plant for use in meeting peak period demands; it would not be intended for base (vice peak) power supply. Net power (power produced and not used by MCB Hawaii Kaneohe Bay) would be sold to the local utility, Hawaiian Electric Company (HECO). This action is intended to improve MCB Hawaii's ability to sustain mission readiness, and is part of MCB Hawaii Kaneohe Bay's plan to become a net zero installation by the year 2015.

The actual specifications, e.g., size of the power plant and type of fuel, and project viability will be dictated by the economics that will be reflected in the proposals from prospective private developers. As these proposals have not yet been obtained, this project is being recognized as deserving of further consideration when more information becomes available, but at present is not incorporated into the cumulative impact evaluation in this EIS.

Army Transformation and Permanent Stationing of the 2/25th Stryker Brigade Combat Team

In 2004, the Army completed a Final EIS for Army transformation of the 2nd Brigade, 25th Infantry Division (Light) to a Stryker Brigade Combat Team (SBCT). In 2008, a Final EIS was published for the Permanent Stationing of the 2/25th SBCT. The Record of Decision (April 15, 2008) allows the permanent stationing of the 2/25th SBCT at Schofield Barracks Military Reservation (SBMR) while conducting required training at military training sites in Hawaii. Training sites include Army training areas on Oahu and Pohakuloa Training Area (PTA) on the island of Hawaii. To implement the proposed actions, no additional cantonment facilities will be constructed and 2/25th SBCT will use existing live-fire ranges to satisfy training requirements. Marine Corps “legacy” aviation training (primarily existing CH-53 operations) at PTA and the Oahu ranges is covered by this EIS and associated Biological Opinions. Army use of these training areas was considered in this MV-22/H-1 EIS in the analysis of land use compatibility, airspace, air quality, noise, biological resources, and Bird Aircraft Strike Hazard (BASH), as well as other resources.

Army Initiatives at the Oahu Training Areas

A Combined Arms Collective Training Facility (CACTF) is planned at the Kahuku Training Area (KTA) to support the 2/25th SBCT. Enhancement of training facilities at KTA could increase the frequency of military training in the area, with cumulative impacts on resource areas such as airspace, noise, and biological resources. In 2008, a Programmatic EA for the Grow the Army initiative was prepared for the stationing of more than 1,000 personnel in Hawaii.

Army Initiatives at the Pohakuloa Training Area (PTA)

U.S. Army Garrison, Hawaii (USAG-HI) is in the process of conducting two NEPA analyses for proposed actions at PTA. One is a Draft Programmatic EIS, published in October 2011, for projects to modernize the training ranges, training support infrastructure, and the cantonment area at PTA (FR October 2011). The action includes short-term and long-term projects. Among the upgrades planned during the short-term is construction of an Infantry Platoon Battle Area within the existing impact area. In the long term, the Army plans to replace old Quonset huts with new barracks. Other long-term projects, currently in the feasibility study stage and not yet programmed, include Marine Corps proposals to upgrade Bradshaw Army Airfield and build a range for MV-22/H-1 training.

The other document is an EA for proposed high-altitude mountainous environmental training (HAMET) on the slopes of Mauna Kea and Mauna Loa. The Army's 25th Combat Aviation Brigade (CAB) has requirements to train helicopter pilots and crews for high-altitude missions in preparation for deployment to Afghanistan. The actions proposed in the Draft Programmatic EIS and the EA indicate the potential for cumulative impacts at the range in a number of resource areas, including airspace, biological resources, and BASH.

Hawaii Range Complex EIS/OEIS

In May 2008, the Department of the Navy prepared the Hawaii Range Complex Final EIS/Overseas EIS. A ROD was signed on June 26, 2008, and a revised ROD was signed on February 26, 2009. The Navy proposed to increase the number of training events in the Hawaii Range Complex (HRC), including additional field carrier landing practice (FCLP), future Research, Development, Testing, and Evaluation (RDT&E) programs, and the addition of major exercises such as supporting three Carrier Strike Groups training at the same time. These activities would take place throughout the Hawaiian Islands with enhancements at the Pacific Missile Range Facility (PMRF). The EIS included all existing training activities, events, and support activities. The proposed enhancements at PMRF included construction of a consolidated range operations complex, Directed Energy Test Center operations building, and equipment upgrades to existing buildings and infrastructure.

Hawaii/Southern California Training and Testing EIS/OEIS

The Hawaii/Southern California Training and Testing (HSTT) EIS/OEIS (in progress) is assessing environmental impacts of training and testing activities throughout the in-water portions of the study area (including MV-22 and H-1 operations), including areas around the Hawaiian Islands. In addition to reassessing in-water activities addressed in the 2008 Hawaii Range Complex EIS, the HSTT EIS/OEIS adjusts baseline training and testing activities from current levels to levels needed to support Navy requirements beginning in January 2014; analyzes impacts in additional areas not covered in previous documents where activities historically occur—including Navy ports, naval shipyards, and transit channels serving these areas; implements enhanced range capabilities; and updates the analysis using the best available science and methods.

Hawaii Range Complex Management Plan

This updated plan (in progress) will include fixed wing, rotary, and tilt rotor aircraft training activities and capabilities supported by PMRF, including training at the water ranges and Kaula Island. New training activities proposed in the HSTT EIS and MV-22 EIS will be discussed. The plan will not include discussion of PMRF airfield operations.

Air Force Initiatives

C-17. Air Force C-17s are among aircraft routinely training at MCB Hawaii Kaneohe Bay; C-17 operations have been taken into account in the land use compatibility, airspace, air quality, and noise impact analyses. The Air Force is currently preparing an EA for C-17 training, including development of a short, austere airfield (SAAF), and is considering several alternative sites in Hawaii. MCB Hawaii Kaneohe Bay and PMRF, currently being used for C-17 training, could be considered as alternative SAAF sites. C-17 training is included in the analysis of airspace and noise impacts, among other resource areas, at these two installations.

F-22. The F-22 will be a replacement of the existing F-15 aircraft in use by the Hawaii Air National Guard (HIANG). The F-22 will be “shared” between HIANG and Air Force squadrons. Training activities for the F-22 will be similar to the F-15, including training at PMRF.

Various Aviation Operations

In conducting operations in Hawaii, Marine Corps aviation units share airfields, training areas, and airspace with other U.S. Department of Defense (DoD) squadrons. Most DoD training is conducted at military installations, but non-DoD facilities are also used and shared with civilian aircraft. Following is a list of known military and civilian users of the training areas proposed for use by the VMM and HMLA squadrons. The operations of these users have been considered in the airspace and noise analyses.

- U.S. Navy at MCB Hawaii Kaneohe Bay and PMRF: VP squadron (P-3 transitioning to P-8A); VPU squadron (P-3C Update); HSL squadron (SH-60) transitioning to HSM squadron (MH-60), C-26.
- U.S. Army based at Wheeler Army Airfield: Combat Aviation Brigade (CH-47, UH-60, OH-58).

- Hawaii Army National Guard (HIARNG) at Wheeler Army Airfield, moving to Kalaeloa soon: Company B, 1st Battalion, 171st Aviation Regiment (CH-47D, OH-58). Based at Hilo Airport is Company B 1st Battalion, 207th Aviation (UH-60, OH-58).
- Hawaii Army National Guard (HIARNG) at Hilo Airport: Company B 1st Battalion, 207th Aviation (UH-60, OH-58).
- U.S. Air Force and Hawaii Air National Guard based at Joint Base Pearl Harbor-Hickam: C17 training primarily at MCB Hawaii Kaneohe Bay; F15/22 training at PMRF.
- U.S. Coast Guard based at Kalaeloa: training at PMRF and KTA (C-130 and HH-60).
- General aviation at Dillingham Airport (part of the Dillingham Military Reservation [DMR]) and on the islands of Maui and Hawaii: helicopter and fixed-wing aircraft.

5.2.2 NON-MILITARY ACTIONS

Other past, present, and future federal, state, and county actions in Hawaii, as well as actions in the private sector, could contribute to cumulative impacts. Relevant major projects are listed here and discussed. No major projects are identified in Windward Oahu in the foreseeable future; most projects would likely be infill in existing developed areas. As stated in Section 3.2.2, the City and County of Honolulu designates the Kaneohe and Kailua communities as residential areas with limited future population growth.

- **Transit Project.** The largest project on the island is the City's planned construction of an elevated rail system between Kapolei on the Ewa plain and Ala Moana Shopping Center in urban Honolulu. Two segments and several stations are under design, and other phases are scheduled to follow. Although the rail alignment is not located near MCB Hawaii Kaneohe Bay or any of the training areas, the magnitude of the project is such that it would affect the capacity of construction contractors and the availability of construction labor islandwide and possibly statewide. This issue is discussed as a cumulative impact in the socioeconomic analysis in Section 5.3.10.
- **Other City and County of Honolulu Projects.** The City has embarked on extensive improvements to its sewage infrastructure. Wastewater treatment plants at Sand Island and Honouliuli must be upgraded to bring them into compliance with the federal Clean Water Act. It is estimated that these projects could cost more than $1 billion (ENS 2009). The City is also planning improvements to its Windward Oahu wastewater facilities, including sewer lines and the Kailua Wastewater Treatment Plant (WWTP) that serves MCB Hawaii Kaneohe Bay. Another major City project is the planned expansion to the H-POWER waste-to-energy facility, which would increase its capacity by approximately 50 percent.

- **Renewable Energy Initiatives.** Hawaiian Electric Company is participating in an agreement between the State of Hawaii and U.S. Department of Energy "to decrease energy demand and accelerate use of renewal, indigenous energy resources in Hawaii in residential, building industrial, utility, and transportation end-use sectors, so that renewable energy resources will be sufficient to meet 70 percent of Hawaii's energy demand by 2030." Hawaiian Electric Company's (HECO's) renewable energy efforts include generating electricity from renewable power (biofuels, wind, solar, ocean energy, biomass, geothermal, seawater air conditioning), sponsoring the largest solar water heating program in the nation, supporting net energy metering, conducting integrated resource planning, installing solar electric system in schools, and increasing energy conservation and efficiency.[4] A major initiative currently being planned is the Hawaii Interisland Renewable Energy Program (HIREP). The State of Hawaii, in cooperation with the U.S. Department of Energy, is preparing a Programmatic EIS for HIREP, which proposes development of an undersea cable system connecting possible wind farms on one or more islands in Maui County to the island of Oahu (HCEI 2010).

- **Harbors Modernization.** The State of Hawaii Department of Transportation (DOT), Harbors Division, has embarked on a commercial harbors modernization initiative. At Kawaihae Harbor on the west side of the island of Hawaii, DOT Harbors Division has been repairing piers and yard areas damaged by the 2006 earthquake. Long-term plans call for additional pier and yard space. Army, Marine Corps, and other units that train at PTA use Kawaihae Harbor. At Hilo Harbor on the east side of the island of Hawaii, a new pier and yard are planned.[5] On the island of Oahu, development of a new container terminal in Honolulu Harbor is proposed at the site of the former Kapalama Military Reservation.

- **Puunene Projects.** A master plan is being developed for the Puunene industrial area on Maui, located in the vicinity of the HIARNG facility. DHHL plans to develop Pulehunui on the west side of Mokulele Highway. The mixed-use development would include light industrial, business, and/or commercial facilities. The development would likely begin within the next three years and be implemented in phases. The Maui Regional Public Safety Complex (MRPSC)[6] jail facility would be constructed on a site adjacent to the HIARNG facility. The complex would serve both male and female pretrial, sentenced, and community workline and furlough inmates. The proposed MRPSC would initially provide up to 843 bed spaces. Improvements include facilities for dining, recreation, education,

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[4] ww.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=3f4190a2decab110VgnVCM1000005c011bacRCRD&vgnextchannel=c6caf2b154da9010VgnVCM10000053011bacRCRD&vgnextfmt=default&vgnextrefresh=1&level=0&ct=article

[5] A long term master plan for Hawaii Island is being updated (www.hawaiiharborsplan.com).

[6] *Environmental Assessment/Environmental Impact Statement Preparation Notice, Maui Regional Public Safety Complex*, State of Hawaii Department of Accounting and General Services, May 2010.

counseling, religious programs, and medical assessment. Administrative facilities and supporting infrastructure are also proposed.

- **Saddle Road Realignment and Improvement Project.** The Saddle Road, linking the east and west sides of the island of Hawaii, provides vehicular access to PTA. Construction of major improvements is in progress.
- **Wind Turbine Projects.** Wind energy projects are located in close proximity to the Kahuku and Kawailoa Training Areas. Given this proximity, the potential for air space encroachment is an issue. In 2011, First Wind opened the Kahuku Wind Farm on lands northeast and adjacent to KTA. First Wind also proposes to develop the Kawailoa Wind Farm on properties adjacent to the Army's Kawailoa Training Area (KLOA). Another wind farm has been proposed for ridge land surrounding the State Agricultural Park in Kahuku, east of the existing wind farm.

5.3 ANALYSIS OF CUMULATIVE IMPACTS

The following analysis is organized by resource area in the same order presented in Chapters 3 and 4.

5.3.1 LAND USE

Land Use Compatibility

Land use compatibility issues may be site-specific (localized) or regional in scope. In the case of land use compatibility issues triggered by aircraft noise, the ROI is localized, i.e., focused on noise sensitive receptors such as residential areas, schools, etc. Noise impacts at MCB Hawaii Kaneohe Bay were analyzed cumulatively, including noise from all aircraft expected to be operating at the base in 2018. The analysis showed changes in noise levels at noise sensitive areas to be small, ranging from 1.3 to 3.0 dB day-night average sound level (DNL) compared to baseline, and from plus 1.1 to minus 0.3 dB DNL compared to the No Action Alternative.[7] Fixed wing aircraft would continue to be the primary contributors to noise in the environs. No mitigation is required.

A noise analysis was conducted to determine potential impacts of aircraft noise on noise sensitive receptors located in proximity to the other training areas. Several training areas were a sufficient distance away from sensitive receptors and, therefore, further analysis

[7] As explained in Section 3.4, aircraft operations under the baseline or existing conditions and No Action Alternative conditions in 2018 differ. For example, only one HMH squadron would remain at MCB Hawaii Kaneohe Bay in 2018 (three HMH squadrons are currently based at Kaneohe). KC-130 operations would also differ.

(noise modeling) was not warranted. The noise analysis focused on Marine Corps Training Area Bellows (MCTAB, KLOA, Schofield Barracks East Range (SBER, DMR, and Kalaupapa Airport. Noise from the MV-22/H-1 aircraft, combined with noise from other military aircraft conducting operations, would not be incompatible with noise-sensitive areas near these training areas. No adverse cumulative land use compatibility issues would occur.

Aesthetics/Visual Resources

This resource issue could be site-specific or regional. In the case of MCB Hawaii Kaneohe Bay and Windward Oahu in general, views can be expansive and hence regional. In addition, aircraft in flight are visible from afar, so the ROI would be regional as well.

Demolition of existing facilities, development of new facilities, and the increase in aviation operations at MCB Hawaii Kaneohe Bay—combined with other on-base development projects—would change the base's appearance when viewed from various off-base locations. The overall view would be similar to existing conditions. New facilities would be consistent in design and appearance with existing facilities. No mitigation is required.

At most of the training areas, the tempo of Marine Corps aviation operations would increase in combination with existing operations by other military services. More aircraft in transit, landing, and taking off would be visible. Views would be similar to existing conditions; no mitigation is required.

Quality of the Built Environment

This issue is relevant only to MCB Hawaii Kaneohe Bay, as projects at the training areas would involve clearing, grading, and paving to existing facilities and no vertical construction. For MCB Hawaii Kaneohe Bay, the ROI is the entire base. Proposed facilities, whether part of the proposed action or part of other initiatives, would be designed to be consistent with existing buildings. Impacts on buildings eligible for listing in the National Register of Historic Places (NRHP) are addressed in Section 5.3.8.

Land Ownership

There would be no change in land ownership at any of the installations or training areas due to the proposed action.

Public Access

The proposed action would not affect public access at any of the installations or training areas, with one exception. The exception is the Molokai Training Support Facility (MTSF), which is currently inactive. When the facility is reactivated, public access would be restricted. This would not contribute to any cumulative impacts.

5.3.2 AIRSPACE

The ROI of this cumulative analysis includes airspace at Marine Corps Air Station (MCAS) Kaneohe Bay and all other training areas. Factors used in evaluating impacts on airspace, identified in Section 3.3.1, include substantial changes in the operational environment, such as an increase in tempo of aircraft operations.

Marine Corps Base Hawaii Kaneohe Bay

Table 5-2 shows the number of aircraft based at MCAS Kaneohe Bay in 2009, the number projected to be based there in 2018, and the net change. Under Alternatives A and B, the number of based aircraft would be 100. This is an increase of 39 percent from 2009. Of the 100 aircraft, 68 percent are Marine Corps with the remaining 32 percent belonging to the Navy.

Table 5-2. Summary of Aircraft Based at MCAS Kaneohe Bay

	Baseline	Alternatives A/B		No Action Alternative	
Aircraft (squadron)	**Aircraft in 2009**	**Aircraft in 2018**	**Net Change From 2009**	**Aircraft in 2018**	**Net Change From 2009**
Marine Corps[1]					
CH-53D (HMH)	36	0	-36	0	-36
CH-53E (HMH)	0	16	+16	32	+32
MV-22B (VMM)	0	24	+24	0	0
UH-1Y (HMLA)	0	12	+12	0	0
AH-1Z (HMLA)	0	15	+15	0	0
C-20G (MCAS VMR)	1	1	0	1	0
SUBTOTAL Marines	*37*	*68*	*+31*	*33*	*-4*
Navy[2]					
P-3C (VP)	18	0	-18	0	-18
P-3C Update (VPU)	3	3	0	3	0
P-8A MMA (VP)	0	18	+18	18	+18
SH-60 (HSL)	12	0	-12	0	-12
MH-60 (HSM)	0	9	+9	9	+9
C-20 (VR-51)	2	2	0	2	0
SUBTOTAL Navy	*35*	*32*	*-3*	*32*	*-3*
TOTAL	**72**	**100**	**+28**	**65**	**-7**

1 U.S. Marine Corps Headquarters. September 2010. *FY2011 Marine Aviation Plan.*

2 U.S. Department of the Navy. November 2008. *Final Environmental Impact Statement for the Introduction of the P-8A Multi-Mission Maritime Aircraft into the U.S. Navy Fleet.*

Table 5-3 summarizes the changes in the number operations at MCAS Kaneohe Bay between the 2009 baseline and projected operations for 2018. Aircraft include Marine Corps, Navy, Army, HIARNG, and Air Force.

Table 5-3. Summary of Annual Aviation Operations at MCAS Kaneohe Bay

Aircraft	2009 Baseline Operations[3]	2018 Projected Operations		Net Change		
		AltsA/B	No Action	Between Alts A/B and Baseline	Between No Action and Baseline	Between Alts A/B and No Action
Marine Corps						
MV-22	—	7,974	—	+7,974	—	+7,974
AH-1/UH-1	—	14,236	—	+14,236	—	+14,236
CH-53D (3 squadrons)	13,584	[2]	[2]	-13,584	-13,584	[2]
CH-53E (1 squadron)	—	8,832	—	+8,832	—	+8,832
CH-53E (2 squadrons)	—	—	12,338	—	+12,338	-12,338
Navy	29,621	34,943	34,944	+5,322	+5,323	-1
Transient	9,464	12,740[1]	13,525[1]	+3,276	+4,061	-785
TOTAL[3]	52,669	78,725	60,807	+26,056 (49%)	+8,138 (15%)	+17,918 (29%)

Notes:
Source: Wyle Laboratories. October 2011. Aircraft Noise Study for Marine Corps Base Hawaii, Kaneohe Bay, Hawaii. WR 11-08 (proposed).
Numbers in parenthesis show the percentage increase.
1 The difference can be attributed to the Marines KC-130 aircraft. The number of KC-130 aircraft will vary depending on the Alternative.
2 The CH-53D aircraft will be replaced by CH-53E. This transition is expected to be completed by 2013. The number of aircraft and squadrons will vary depending on the Alternative.
3 From 1999 to 2010, the average number of operations at MCAS Kaneohe Bay is 62,740 operations, with a peak of 79,800 operations in 2003.

Other Training Areas

Table 5-4 summarizes the changes in aviation operations between the 2009 baseline and projected operations for 2018 at other training areas. For cumulative analysis, airspace activities include the proposed new squadrons, the CH-53E replacement of the CH-53D, operations of other military services, and civilian/general aviation activities.

Table 5-4. Summary of Annual Aviation Operations at Other Training Areas in Hawaii

Training Area	2009 Baseline Operations	2018 Projected Operations		Net Change		
		Alts A/B	No Action	Between Alts A/B and Baseline	Between No Action and Baseline	Between Alts A/B and No Action
MCTAB	240	468	213	+228	-27	+255
Kahuku/Kawailoa Training Area, Schofield Barracks East Range	17,067	24,327	24,740	+7,260	+7,673	-413
Dillingham Military Reservation	51,698[2,3]	66,847	65,709	+15,949	+14,011	+1,138
Pohakuloa Training Area	26,965[2]	47,198	37,277	+20,233	+10,312	+9,921
Pacific Missile Range Facility	6,947	12,084	10,150	+5,137	+3,203	+1,934
Kaula Island	148[5]	328	132	+180	-16	+196
Molokai Training Support Facility	0	0	0	0	0	0
Kalaupapa Airport	3,355	5,038	3,695	+1,683	+340	+1,343
TOTAL	106,420	156,290	141,916	49,870 (47%)	35,496 (33%)	14,374 (10%)

All projects involving aircraft use within the airspace being evaluated under the proposed action have been considered. The cumulative increase in use would require increased coordination between Federal Aviation Administration (FAA) and military airspace managers. Application of established airspace management and use procedures, as promulgated in FAA and DoD regulations, would continue to minimize airspace conflicts.

5.3.3 AIR QUALITY

The ROI considered in this air quality cumulative analysis includes areas in and adjacent to the proposed basing location and training areas. Cumulative impacts during construction and operations, as well as greenhouse gas impacts, are discussed in this section.

Construction Impacts

Construction related emissions include stationary and mobile (vehicular) sources. During the construction period, activities in the vicinity of MCB Hawaii Kaneohe Bay potentially contributing to short-term impacts on air quality would be limited to those within the base. Such projects and anticipated time frames include the MILCON and MCCS projects listed above. Cumulative emissions associated with generators, equipment, and vehicles associated with these projects would increase, but only temporarily, and would not significantly impact National Ambient Air Quality Standards (NAAQS). Construction projects at MCTAB, PTA, and MTSF would be minor and of short duration and, therefore, not contribute to cumulative impacts.

Operational Impacts

Operational related emissions include stationary and mobile (aircraft and vehicular) sources. No major stationary sources (as defined under the Prevention of Significant Deterioration [PSD] program), which represent point sources of a substantial size, have been identified in the cumulative impacts evaluation. Non-major (smaller) stationary source emissions are regulated in such a manner that their cumulative emissions would not cause exceedances of the National or State Ambient Air Quality Standards (AAQS). Therefore, no significant cumulative impacts on air quality would occur as a result of the operation of stationary sources at MCB Hawaii Kaneohe Bay or at the training areas analyzed in this EIS.

Aircraft. The primary source of emissions from mobile sources (and all sources) would be from aircraft. Emissions most likely to cumulatively affect air quality at any one point would be from aircraft operating at MCB Hawaii Kaneohe Bay. For these reasons, the following projects affecting MCB Hawaii Kaneohe Bay are specifically addressed: the proposed action, other relevant Marine Corps actions identified in the AvPlan (USMC 2010b), and Navy actions identified in the Naval Aviation Vision 2032 (Navy 2010).

Table 5-5 summarizes the aviation projects/initiatives affecting MCB Hawaii Kaneohe Bay and their estimated annual air emissions. Considering the actions described above and their associated emissions, no significant impacts on air quality would occur from these cumulative actions. With the emissions less than PSD thresholds, the dispersive nature of the aircraft emissions, and the dispersive nature of the atmospheric environment in the state of Hawaii, emissions are unlikely to be concentrated and significantly affect National or State AAQS.

Table 5-5. Estimated Annual Air Emissions from Aircraft Based at MCB Hawaii Kaneohe Bay

Actions	Aircraft	Source	CO	NOx[1]	SOx[1,2]	PM10	PM2.5
Proposed Action	MV-22/H-1	Chapter 3 and Chapter 4 emissions.	95.53	245.45	10.09	48.56	48.56
USMC FY2011 Marine Aviation Plan	CH-53D/CH-53E-K/C-20	Not applicable.	Not quantified; based on a net decrease of 24 CH-53D's, emissions likely to be negative.				
Naval Aviation Vision 2032	P-3/P-8	Navy 2008b	-37.6	-11.1	-0.6	-25.5	-25.5-
Naval Aviation Vision 2032	P-3/SH-60/MH-60/C-20	Not applicable.	Not quantified; based on a net decrease of 3 H-60's, emissions likely to be negative.				
Totals			**<57.93**	**<234.35**	**<9.49**	**<23.06**	**<23.06**
PSD			**250**	**250**	**250**	**250**	**250**

1 Oxides of nitrogen (NO_x) and oxides of sulfur (SO_x) presumed to be 100 percent converted to NO_2 and SO_2, respectively.

2 Emissions from Final Environmental Impact Statement for the Introduction of the P-8A Multi-Mission Maritime Aircraft into the U.S. Navy Fleet (Navy 2008b) represent SO_2.

Vehicles. Cumulative increases in vehicular trips would occur with the projects described above. In general, because of the relatively low cumulative number of vehicles per hour and the dispersive nature of the atmospheric environment in Hawaii, vehicular emissions are unlikely to cause exceedances of the National or State AAQS. However, any impacts on air quality are best minimized by reducing traffic delays (idling). Intersection improvements and increased efficiencies at the entry gate to improve traffic flow would minimize the potential for concentrating vehicular emissions and impacts on air quality. No significant impacts on air quality would occur from vehicular emissions.

Greenhouse Gases

Greenhouse gases (GHGs) include carbon dioxide (CO_2), methane, nitrous oxide, hydofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Each of these gases have their own global warming potential (GWP), a measure used to indicate the ability of the gas to trap heat in the atmosphere relative to CO_2. Methane has 21 times the warming potential than CO_2, so it has a GWP of 21; CO_2's GWP is 1. Using these GWPs and the quantities of each gas, the gases can be aggregated and expressed in million metric tons of carbon dioxide equivalent ($MMTCO_2Eq$).

Anthropogenic emissions of GHGs are a concern as they have been found to correlate with increases in global temperatures. In 1992, the U.S. signed and ratified the United Nations Framework Convention on Climate Change (UNFCCC), which has the ultimate objective of achieving stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Further, the UNFCCC identifies that such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner (EPA 2011). GHG inventories are part of the process to achieve these objectives.

The latest national inventory estimates that total U.S. GHG emissions in 2009 were 6,633.2 $MMTCO_2Eq$. The energy sector, primarily fossil fuel combustion, represented 83 percent of the total U.S. GHG emissions. Other sectors contributing lesser amounts were: industrial processes; solvent and other product use; agriculture; land use, land-use change, and forestry; and waste. In 2008, total U.S. GHG emissions were 7,061.1 $MMTCO_2Eq$ and the energy sector contribution was 6,116.6 $MMTCO_2Eq$ or 87 percent (EPA 2011). The 6.1 percent reduction in total U.S. GHG emissions from 2008 to 2009 is attributed to (1) a decrease in economic output resulting in a decrease in energy consumption across all sectors, and (2) a decrease in the carbon intensity of fuels used to generate electricity due to fuel switching as the price of coal increased and the price of natural gas decreased significantly.

The potential effects of proposed GHG emissions are by nature global and cumulative impacts, as individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact on global climate change would only occur when GHG emissions resulting from a proposed action combine with GHG emissions from other man-made activities on a global scale.

Currently, there are no regulatory levels established for GHGs. As a result, this EIS examines the relative GHG emissions that would result from implementation of the proposed action with respect to the U.S. GHG inventory of 2009. In accordance with Executive Order (EO) 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, agencies were required to develop "agency-wide reductions of scope 1 and 2 greenhouse gas emissions in absolute terms by fiscal year 2020, relative to a fiscal year 2008 baseline of the agency's scope 1 and 2 greenhouse gas emissions. Where appropriate, the target shall exclude direct emissions from excluded vehicles and equipment (i.e., military aircraft, tactical vehicles)". DoD developed a 34 percent GHG reduction goal; the GHG emissions from excluded vehicles and equipment are still contained in the inventory.

Table 5-6 summarizes the primary source of emissions for the Marine Corps' proposed action. As shown, GHG emissions represent approximately 0.0015 percent (0.1018 $MMTCO_2Eq$/6,633.2 $MMTCO_2Eq$) of the annual U.S. GHGs. Over the course of the proposed action's lifetime (estimated 30 years for purposes of this assessment), the cumulative aircraft emissions could be approximately 3.05 $MMTCO_2Eq$. As these GHG emissions would represent a minimal percentage compared to national emissions, they would not substantially contribute to global climate change. Details of these GHG emissions estimates are presented in Appendix E.

Table 5-6. Estimated GHG Emissions for Proposed Action

Description	CO_2 (tons/yr)	CH_4 (tons/yr)	N_2O (tons/yr)	CO_2Eq[c] ($MMTCO_2Eq$)
Personal-Owned Vehicles (a)	2,151.19	0.04	0.00	0.0024
Government-Owned Vehicles (a)	192.22	0.00	0.00	0.0002
Ground/Tactical Support Equipment (b)	10,966.12	0.20	0.02	0.0121
Operational (non-aircraft) Subtotals	*13,309.53*	*0.25*	*0.02*	*0.0147*
VMM/MV-22 (24 aircraft)	64,844.90	9.07	0.67	0.0719
HMLA/AH-1 (15 aircraft)	6,267.87	0.00	0.00	0.0069
HMLA/UH-1 (12 aircraft)	7,476.23	0.00	0.00	0.0082
Operational (aircraft) Subtotals	***78,588.99***	***9.07***	***0.67***	***0.0871***
Operational Totals	91,898.52	9.32	0.69	0.1018

National Inventory (2009)	6,633.2
Proposed Action/ National Inventory	.0015%
Aircraft GHG Lifetime (30 years)	3.05

Notes:
[a] Based on population.
[b] Based on aircraft.
[c] $MMTCO_2Eq$=[(CO2 tons/yr x 1.1023 metric tons/ton x CO2 GWP) + (CH4 tons/yr x 1.1023 metric tons/ton x CH4 GWP) + (N20 tons/yr x 1.1023 metric tons/ton x N2O GWP)] x [1MMT/1E+6 metric tons]. Where, CO2 GWP=1; CH4 GWP=21; N2O GWP=310

In consideration of the GHG emissions associated with the two action alternatives, emissions would be comparable. The main minor difference would occur with the additional GHG emissions associated with short-term construction activities. Construction GHGs under Alternative A would be greater than under Alternative B. However, the effect on cumulative GHG emissions would be small (construction emissions are estimated to be similar to non-aircraft operational GHGs in Table 5-6). Moreover, construction GHG emissions would occur over the course of only several years and would not annually contribute to the cumulative emissions over the lifetime (approximately 30 years) of the proposed action.

Current global data trend shows an annual increase in GHG emissions. With the implementation of several federal laws and EOs (U.S. EPA 2005, EISA 2007, EO 13514, EO 13423) and agency goals (Sail the Great Green Fleet, etc.), the DoD, DoN, and Marine Corps are actively reducing energy intensity and GHG emissions. The following paragraphs summarize some of these initiatives, including broad-based strategic programs to reduce energy consumption and shift to renewable and alternative fuels.

- As part of efforts to encourage the development of alternative fuels, on January 22, 2010, the DoN and the Department of Agriculture signed a Memorandum of Understanding (MOU) to encourage the development of advanced biofuels.
- The DoN and Marine Corps are developing and implementing energy conservation programs designed to increase awareness about energy conservation. These programs reach out to Marines, support staff, and residents of the base.
- All new MILCON construction is required to achieve Leadership in Energy and Environmental Design (LEED) Silver status. New construction such as the bachelor enlisted quarters (BEQs) and the new youth center, which are LEED projects, incorporate solar photovoltaics (PV) and energy efficiencies such as daylighting and lighting controls.
- Recent PPV family housing developments have incorporated energy-efficient designs and techniques that serve to minimize overall energy consumption. These projects incorporate water-efficient fixtures, implement efficient waste handling methods and provisions for recycling waste products, and recycle demolition debris to the extent practicable.
- Participation in the DoN's Resident Energy Conservation Program encourages PPV military housing residents to use less energy within their homes. Historically, military residents were provided "free" electricity, so there was no incentive for residents to consider their electrical use. This policy involves charging PPV residents for electrical use above an established normal usage band and providing credit to those who fall below the band. In addition to PPV housing residents at MCB Hawaii Kaneohe Bay, PPV residents at Camp Smith and Manana Housing are participating in this conservation program.
- The non-exempt MCBH motor-T fleet (i.e., service vehicles on base) is being transformed from approximately 85 percent gas, 5 percent electric vehicle (EV), 10 percent ethanol 85

(E85), to 41 percent gas, 18 percent EV, and 41 percent E85 in 2015, with a 2020 goal of 100 percent EV.

- MCBH's main renewable energy projects at this point include obtaining up to 15 MW of solar power from the solar multiple award contract (MAC) contract (waiting for awards), a biofuels power plant via enhanced use lease (in Phase II, with an industry forum for prospective private partners anticipated in late 2011 or early 2012), and various roof-PV projects.

A 12 to 15 percent energy intensity reduction is anticipated. Additionally, with the implementation of large scale renewable projects, MCB Hawaii Kaneohe Bay is a candidate for becoming a net-zero base (producing more energy than it consumes). The DoN renewable energy initiatives are not proposed to directly compensate for "ton for ton" GHG emissions produced by the proposed action. These initiatives, and other GHG reductions programs, will provide concurrent reductions in emissions that will occur at the same time as the proposed action.

Climate Change Adaptation

In addition to assessing the GHG emissions that would come from the proposed action and the potential impact on global climate change, the analysis must also assess how climate change might impact implementation of the proposed action and what adaptation strategies could be developed in response. This is a global issue for DoD. As is clearly outlined in the *Quadrennial Defense Review Report* of February 2010 (QDR), the DoD would need to adjust to the impacts of climate change on its facilities and military capabilities should such change occur. DoD already provides environmental stewardship at hundreds of installations throughout the U.S. and around the world, working diligently to meet resource efficiency and sustainability goals as set by relevant laws and EOs. Although the U.S. has significant capacity to adapt to potential climate change, it would pose challenges for civil society and DoD alike, particularly in light of the nation's extensive coastal infrastructure. In 2008, the National Intelligence Council judged that more than 30 U.S. military installations would face elevated levels of risk from potentially rising sea levels. DoD's operational readiness hinges on continued access to land, air, and sea training and test space. Consequently, the DoD must complete a comprehensive assessment of all installations to assess the potential impacts of predicted climate change on its missions and adapt as required.

The QDR goes on to illustrate that DoD would work to foster efforts to assess, adapt to, and mitigate the impacts of climate change. Within the U.S., the DoD would leverage the Strategic Environmental Research and Development Program, a joint effort among DoD, the

Department of Energy, and the U.S. Environmental Protection Agency (EPA), to develop climate change assessment tools.

In Hawaii, the following have been observed: air temperature has risen, rainfall and stream flows have decreased, rain intensity has increased, sea level and sea surface temperatures have increased, and the ocean is acidifying (Fletcher 2010). While all of these changes can affect the proposed action, most likely in a negligible manner throughout the lifetime of the proposed action (approximately 30 years from 2009), the longer term effects of sea level rise on the low-lying facilities considered under this proposed action are discussed here.

Sea level rise can accelerate and expand erosion along beaches. Certain research indicates that a rise of 3 feet (ft) (0.9 meters [m]) above the 1990 level could occur by the end of the 21st century (Vermeer 2009; Fletcher 2009). While geographic variability exists and more monitoring and studies are needed, sea level rise is anticipated to continue. If sea level rise were to affect the low-lying areas of MCB Hawaii Kaneohe Bay and MCTAB, any activities on these installations would be displaced. As recognized in the QDR, potentially impacted areas in those portions of the installations need to be assessed so that DoD can adapt with the effects of climate change.

In accordance with EO 13514, the White House Council on Environmental Quality issued implementing instructions for Federal agency climate change adaptation planning (2011). In turn, DoD is currently developing more specific adaptation policy that follows the CEQ instructions and builds upon the strategic direction provided in the QDR. As climate science advances, the DoN will regularly reevaluate climate change risks and opportunities at the bases in order to develop policies and plans to manage its effects on the operating environment, missions, and facilities. Managing the national security effects of climate change will require DoN to work collaboratively, through a whole-of-government approach, with local, state, and federal agencies.

5.3.4 NOISE

As explained in Section 5.3.1 above, noise is analyzed cumulatively, taking into account activities by others that generate noise in the same ROI. Chapters 3 and 4 address the direct impacts of construction and aircraft noise. The ROI is the airfield or training area environs.

At MCB Hawaii Kaneohe Bay, development of improvements to support the VMM and HMLA squadrons is estimated to take place over six to ten years during the same period as other projects, such as the P-8A facilities. Because the base is located on a peninsula separated from other communities, and the use of quiet equipment and construction curfew periods would be implemented, cumulative construction noise impacts would be minimal. No mitigation is required.

Modeling for aircraft noise at MCB Hawaii Kaneohe Bay involved inputting data on all of the types of aircraft currently using the airfield and expected to use the airfield in 2018 under the action and No Action alternatives, including flight tracks and altitude profiles, type and frequency of operations, time of day, and other data. Resulting noise contours represent cumulative noise levels. The following aircraft types were included in the modeling: addition of MV-22 and H-1 aircraft operations; continuation of CH-53 and SH-60 aircraft operations; replacement of P-3C with P-8A aircraft; continuation of C-17, C-5A, and AN-124 aircraft operations; and addition of KC-130 operations. The noise analysis disclosed that fixed wing aircraft would continue to be the dominant contributors (approximately 90 percent) to the DNL noise contours at the base and its environs. Forecasted changes in aircraft noise levels attributed to the MV-22 and H-1 aircraft at six noise sensitive areas would be very small (see Section 5.3.1).

As discussed in Section 5.3.1 above, cumulative aircraft noise impacts were analyzed at MCTAB, SBER, KLOA, DMR, and Kalaupapa Airport due to the proximity of noise sensitive receptors. Noise from the MV-22/H-1 aircraft, combined with noise from other military aircraft conducting operations, would not be incompatible with noise sensitive areas near these training areas. No adverse cumulative land use compatibility issues would occur.

5.3.5 GEOLOGY, SOILS, AND TOPOGRAPHY

The effects on geology, soils, and topography are site-specific and relate to construction activities and subsequent operations. Cumulative impacts for this resource area may occur at MCB Hawaii Kaneohe Bay, where major construction projects are proposed as part of the proposed action and as part of other initiatives, and at training areas where aircraft land at unpaved LZs. Construction at the training areas would be relatively minor, limited to improving existing LZs. Geotechnical aspects include ground settlement, erosion hazard, shrink-swell potential, site grading, and soil disturbance. Construction activities and site grading would result in temporary soil disturbances. Erosion related impacts may occur during operations due to aircraft downwash.

No significant cumulative impacts would be related to geology, soils, and topography during construction. Proposed construction occurring within the same ROI and time period would be carried out in compliance with project-specific National Pollutant Discharge Elimination System (NPDES) permit requirements. Excessive ground settlement, erosion, and expansive soil impacts are not anticipated with the implementation of applicable geotechnical engineering practices during design and construction, as well as incorporation of Best Management Practices (BMPs) prior to and during construction.

With increased frequency of aviation training by all users, cumulative erosion impacts due to aircraft downwash are possible at unpaved LZs at the Army's Oahu training areas. Soils at SBER and parts of KLOA have relatively high erosion potential. Conditions would be monitored at unpaved LZs in these training areas, and should field observations verify that erosion is occurring, the Marine Corps would work with the range manager to implement repairs or other maintenance actions.

5.3.6 DRAINAGE, HYDROLOGY, AND WATER QUALITY

MCB Hawaii Kaneohe Bay

The cumulative ROI scope for this resource area is the drainage and ground water tributary to Kaneohe Bay. This includes the Kaneohe region, with streams and ground water originating from the Koolau mountains, combined with drainage from Mokapu peninsula. Water quality in Kaneohe Bay has the potential to be affected by surface water runoff from construction sites and operational activities at MCB Hawaii Kaneohe Bay. Off-base construction in the same tributary areas may also impact Kaneohe Bay water quality. Drainage from projects/activities related to the proposed action would not discharge to Kailua Bay to the east of the base or to the Nuupia Ponds. Project-specific NPDES permit requirements, including BMPs, would avoid water quality impacts during construction.

Another aspect of hydrology and drainage relates to potable ground water in Windward Oahu. There are no potable ground water sources on the base. Due to its geographic location and physical configuration, MCB Hawaii Kaneohe Bay is essentially surrounded by the ocean, and actions on the base do not affect potable ground water in other Windward Oahu areas. No cumulative impacts to potable ground water would be associated with the proposed action.

Fuel spills and other hazardous material leaks are a potential concern on a cumulative basis, during both construction and operations. For all projects on the base, impacts to water quality would be avoided or minimized with implementation of procedures and practices in place to handle spills and other contamination (Spill Prevention, Control and Countermeasure Plan and Integrated Contingency Plan).

With development of new facilities, an increase in impervious surfaces would increase storm water runoff. The projects intended to support the VMM and HMLA squadrons are estimated to add 20 acres [ac] (8.1 hectares [ha]) of impervious surface, which represents approximately 2.3 percent of the developed part of the base. Another 13.4 ac (5.4 ha) of impervious surfaces would be added by other projects, including BEQs, multi-purpose training complex, Artillery Battalion complex, ordnance storage magazine, and various MCCS projects. The potential cumulative effect is an estimated 33.4 ac (13.5 ha) of impervious surfaces due to new construction. Low impact development (LID) design would be implemented to the maximum extent feasible to maintain storm water discharge to pre-development conditions.

Other Training Areas

No cumulative impacts would be associated with drainage, hydrology, and water quality at the other training areas. Minor construction to improve existing facilities would occur at MCTAB, PTA, and MTSF; all would be accomplished in compliance with applicable regulations to prevent runoff outside the project boundaries. Addition of impervious surfaces would be minimal (less than 0.1 percent of the total training area at MCTAB, 0.001 percent at PTA, and 3.3 percent at MTSF) and is unlikely to contribute cumulatively to increased storm water runoff. No cumulative impacts are expected during operations.

5.3.7 BIOLOGICAL RESOURCES

For cumulative impacts on biological resources, the scope of the analysis varies depending on known occurrences of a resource and the availability of suitable habitat. It is recognized that Hawaii has a large number of Endangered Species Act (ESA)-listed endemic species unique to the islands. In accordance with Section 7 of the ESA, the Marine Corps has completed informal consultation on specific species; related correspondence is presented in Appendix J.

- **ESA-listed plant species.** The only ESA-listed plant found within an area to be developed or used for training by the new squadrons were two creeping mint (*Stenogyne angustifolia*) plants recorded near the outer edge of the buffer area of LZ Xray at PTA. Aircraft downwash is not expected to affect this plant; no mitigation is required. USFWS concurred with DoN's "no effect" determination regarding *Stenogyne angustifolia*. No impacts are expected on candidate plant species on Oahu being proposed by USFWS. The proposed action would have no cumulative impacts on listed plant species.

- **ESA-listed animal species.** ESA-listed terrestrial animal species have been observed at MCB Hawaii Kaneohe Bay, MCTAB, SBER, KLOA, PTA, and PMRF. ESA-listed marine species have been observed at MCB Hawaii Kaneohe Bay, MCTAB, Kalaupapa Airport, and PMRF. Management practices are in place to protect these species.[8] Proposed

[8] For example, terms and conditions of the 2003 Biological Opinion require PTA to develop and implement protocols to determine bat presence, guidelines to protect bats from direct harm and/or harassment, and to maintain, enhance, and

construction activities would have no cumulative effect on threatened or endangered species. There is a potential for cumulative impacts on listed animal species due to the increased frequency of aviation operations by all users of these training areas. One particular concern is the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), known to occur at the Army's training areas on Oahu and PTA, and also at PMRF. It is Hawaii's only native land mammal. Cumulative aviation training may affect the Hawaiian hoary bat at the Army's training areas on Oahu and at PTA. USFWS concurred with DoN's determination of "may affect but not likely to adverse affect" the Hawaiian hoary bat. In addition, USFWS concurred with a determiniation of "may affect, but not likely to adversely affect" the listed species *Branta sandvicensis* or nene at PTA. This determination was based on PTA operating procedures (2003 and 2008 biological opinions) to prevent nene interaction during training. No impacts are expected on insect species on Oahu being proposed for ESA-listing by the USFWS.

- **Migratory Bird Treaty Act (MBTA)-listed species.** MBTA-listed species occur at all of the installations and training areas assessed in this EIS except at MTSF and the HIARNG Facility. With increased operations by all users of the training areas, there is an increased potential for aircraft strikes involving migratory birds and certain ESA-listed bird species, particularly those that frequent airfields. MCB Hawaii follows a BASH Plan to manage the risk and contracts U.S. Department of Agriculture (USDA) Wildlife Services for BASH control at the installation. USAG-HI implements a BASH prevention program at DMR and Bradshaw Army Airfield at PTA and contracts USDA Wildlife Services for BASH control. PMRF follows a BASH Plan for the base and relies on USDA Wildlife Service's BASH control measures. Kalaupapa Airport is under State DOT Airports management, which receives guidance from USDA Wildlife Services. With these measures, cumulative BASH risks could be minimized. When operating at training areas without BASH programs in place, the squadrons would manage BASH risk through compliance with aviation SOPs. There is a potential cumulative risk of bird strikes at KTA and KLOA, where aviation training combined with existing and proposed wind turbines could affect ESA- and MBTA-listed bird species known to occur in the area.

- **Critical habitat.** There would be no cumulative impacts on USFWS-designated critical habitat. There is no critical habitat at MCB Hawaii Kaneohe Bay. Sections of PMRF are designated as unoccupied critical habitat for the endangered *Panicum niihauense,* a plant that occurs at Polihale State Park north of the range but not within PMRF. None of the other airfields or LZs proposed for training are within critical habitat.

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replace lost roosting and forage habitat. A protocol for hoary bat management is included in the Pohakuloa Implementation Plan (USAG-HI 2010).

- **Jurisdictional wetlands.** No cumulative impacts on jurisdictional wetlands have been identified. Wetlands are found at MCB Hawaii Kaneohe Bay; none are in the vicinity of where construction or aviation activities are proposed. Wetlands are located within MCTAB, but not in the vicinity of the LZs proposed for training. None of the identified wetlands within the Army's training areas on Oahu or PTA are in the vicinity of LZs proposed for training by the Marine Corps squadrons. No jurisdictional wetlands occur at the other training areas considered in this document.
- **Coral reefs.** There would be no cumulative impacts to coral reefs due to the proposed action and aviation activities by others in the same training areas. No coral reefs are found in the vicinity of development proposed under either Alternative A or B at MCB Hawaii Kaneohe Bay. At MCTAB, none of the LZs are located along the shoreline close to coastal waters, and living coral comprises only two percent of the bottom of the inner bay at Waimanalo. In waters fronting the runway at PMRF, living corals are sparsely distributed and occur predominantly as flat encrustations on flat bottom. Continual wave action appears to limit coral growth in this area. Kalaupapa Airport is another training area located along a coast. The marine environment is characterized by extremely low coral cover. These conditions are attributed to extreme wave turbulence during winter months.
- **Invasive species.** The spread of invasive species is a statewide concern. With aviation training conducted on five islands and the increased training frequency by the Marine Corps and others, there is a potential for cumulative impacts, including the inadvertent introduction of invasive species from one island to another. The Marine Corps, Army, and Navy all have management measures, part of their INRMPs, to address invasive species. These measures serve to reduce the cumulative risk. The Marine Corps follows procedures to control invasive plants and animals at MCB Hawaii Kaneohe Bay and MCTAB. SOPs include education, monitoring, and control to prevent the transport of invasive species between training areas. At its training areas on Oahu, the Army spends considerable effort on controlling non-native weed species, as they pose a serious threat to native ecosystems found in more remote areas. At PTA, the Army conducts a non-native plant monitoring program to control invasive species in and adjacent to landing zones and trails, around federally listed species, and along roadsides. PTA also has monitoring and control protocols to prevent the spread of invasive invertebrates such as Argentine ants and yellow jackets, both threats to native faunal species. Accordingly, the potential for cumulative effects is considered to be minor.
- **Wildland fires.** See the discussion of cumulative wildland fire risk in section 5.3.9 below.

5.3.8 CULTURAL RESOURCES

In the evaluation of cumulative impacts on cultural resources, the area of potential effect (APE) for NRHP-eligible archaeological resources, traditional cultural resources, and buildings at MCB Hawaii Kaneohe Bay is the entire base or the entire Mokapu Peninsula. At the training areas, the analysis is relevant only to archaeological and traditional cultural resources, as no historic buildings are located within the APE of the LZs, DZs, and other facilities proposed for training operations. At all of the training areas except for MTSF, where no archaeological or traditional cultural resources are found, the APE for cumulative impacts on NRHP-eligible resources could be the entire installation or facility, and in certain cases it could be argued that the APE is regional, for example, the ahupuaa or traditional land division in which the facility is located. In the case of Kalaupapa Airport, located within the Kalaupapa National Historical Park, which is designated as a National Historic Landmark (NHL) and listed in the NRHP, the APE is the entire NHL.

In accordance with NHPA Section 106, the Marine Corps is consulting with the State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (ACHP), the National Park Service (NPS), Native Hawaiian organizations (NHO) and individuals, other interested parties, and the public. The Marine Corps is developing a Programmatic Agreement (PA) in consultation with the aforementioned consulting parties to resolve known adverse effects on historic properties within the APE, and to establish the process whereby additional consultation will occur for those parts of the proposed action that have uncertain effects on historic properties (e.g., should additional surveys of LZs at PTA reveal historic properties that cannot be avoided under the proposed action). The PA includes stipulations to be implemented that will result in minimizing and mitigating impacts to historic properties. Minimizing cumulative impacts to cultural resources will be achieved in part by mitigating the impacts to historic properties.

MCB Hawaii Kaneohe Bay

At MCB Hawaii Kaneohe Bay, two alternatives are being considered for the BEQ project. Alternative A would involve demolition of six NRHP-eligible BEQ buildings, and Alternative B would involve demolition of four NRHP-eligible BEQ buildings. New BEQ facilities would be constructed on the vacated site under both alternatives. In addition, facilities demolished to accommodate new MV-22 facilities under Alternative A and Alternative B would differ. The proposed action includes demolition of a total seven NRHP-eligible facilities under Alternative A and 15 NRHP-eligible facilities under Alternative B. With both Alternatives A and B, nine NRHP-eligible facilities at MCB Hawaii Kaneohe Bay would be modified/renovated.

There would be cumulative impacts on individual NRHP-eligible buildings. None of the nine other buildings proposed to be demolished under separate actions are eligible for listing in the National Register.[9]

Cumulative impacts on archaeological resources and traditional cultural resources at MCB Hawaii Kaneohe Bay are possible during ground disturbance associated with construction of the projects evaluated in this EIS, other MILCON projects, PPV projects, and MCCS projects. There is a probability of encountering human skeletal remains in secondary context (sand fill) during ground disturbing activities. Appropriate measures to resolve adverse effects associated with the proposed action that cannot be avoided will be included in the PA being developed in consultation with consulting parties, as part of the NHPA Section 106 process.

Other Training Areas

The VMM and HMLA squadrons plan to conduct aviation training statewide, with the potential for cumulative impacts at training areas associated with construction and operations.

There is a potential for construction-related impacts only at MCTAB, where subsurface archaeological deposits have been identified within the APE of three LZs. The need for mitigation, determined in the NHPA Section 106 consultation process, would depend upon the depth of the ground disturbance required for LZ improvements and the depth of the deposits. Construction is also proposed at PTA and MTSF, but no cultural resources have been indentified within the subject APEs.

The potential for cumulative impacts during operations is unlikely at most of the LZs and other training facilities. No loss of historic resources is anticipated in these areas. At MCTAB, MV-22 rotor downwash is not expected to have an adverse impact on buried cultural deposits within the APEs because of their depth below the surface and existing dense vegetation coverage. At DMR, archaeological sites are surface structures (revetments) or subsurface features beneath paving that should not be affected by downwash. At PTA, two archaeological sites have been recorded within the APEs, but the sites contain features that would not be vulnerable to rotor downwash. When operating at PMRF, aircraft would be restricted from flying over sand dune areas, avoiding impacts on cultural deposits.

[9] These are buildings associated with five of the MILCON projects listed in Table 5-1.

Due to concerns related to downwash from the MV-22, the Marine Corps has agreed not to include MV-22 use of Kalaupapa Airport as part of the proposed action. Consultations are ongoing regarding the potential effect on the Kalaupapa NHL related to increasing the number of operations at Kalaupapa Airport to include HMLA (H-1) use. At the current time, the Marine Corps is not aware of other proposals to increase use of this airport by non-commercial aircraft; accordingly, there would be no cumulative impact on the NHL beyond any impact related to the proposed H-1 use.

No archaeological resources have been identified within the APEs at KTA, KLOA, SBER, MTSF, or the HIARNG Facility. However, at three locations—KTA, KLOA, and PTA—additional archaeological surveys are needed prior to MV-22 training at selected LZs and other facilities to determine the presence of additional surface archaeological resources within the APEs.

5.3.9 SAFETY AND ENVIRONMENTAL HEALTH

Natural Hazards

The geographic scope for flood, tsunami, and seismic hazards is site specific. DMR, PMRF, MCTAB, and portions of MCB Hawaii Kaneohe Bay and Kalaupapa Airport are in areas with flooding potential. KTA, KLOA, and SBER are located where flood hazards are undetermined but possible. The only site within a flood zone proposed for construction of new facilities is West Field at MCB Hawaii Kaneohe Bay (MV-22 facilities under Alternative B). The proposed construction at MCTAB would involve upgrading existing LZs. No MILCON project listed in Table 5-1 is in a flood zone. There would be no cumulative impacts related to construction within the flood zone at MCB Hawaii Kaneohe Bay.

PMRF, the flight line at DMR, West Field at MCB Hawaii Kaneohe Bay, and Kalaupapa Airfield are within the tsunami evacuation zone. Only one of these sites—West Field—is proposed for facilities development (Alternative B). One of the MILCON projects listed in Table 5-1 Waterfront Operations Facility (replacement of an existing facility)—is also in the tsunami evacuation zone. The cumulative effect of having additional facilities subject to tsunami would be managed through compliance with evacuation procedures.

Earthquake activity is common on the island of Hawaii. The islands of Oahu, Molokai, and Maui are also subject to earthquake activity. Seismic threat on the island of Kauai is low. No cumulative seismic risk is expected, given compliance with design and construction standards.

Hazardous Materials and Waste

The geographic scope for hazardous materials and hazardous waste is site-specific. The proposed action would involve the use of hazardous materials and the generation of hazardous waste in the short term during demolition/construction and in the long term during operations. Installation Restoration Program (IRP) sites located near or within areas where construction is planned at MCB Hawaii Kaneohe Bay would be addressed through avoidance of the sites or other appropriate actions. Cumulative impacts are possible during training, given the cumulative increase in the frequency of aviation operations by the Marine Corps and other users of the training areas. All aviation units would comply with their applicable Hazardous Waste Management Plans, including installation-specific requirements, to avoid/minimize impacts. Accordingly, the potential for cumulative effects is considered to be minor.

Airfield Safety

The ROI for airfield safety is site-specific—the airfield, LZ, or other facility where aviation operations are being conducted. There would be no cumulative airfield safety impacts. All new facilities at MCB Hawaii Kaneohe Bay, both related to the proposed action or part of other initiatives, would meet airfield safety requirements for runway clear zones, accident potential zone, and transitional surfaces. All of the airfields and LZs proposed for training activities by the VMU and HMLA squadrons are designed to meet either DoD or FAA requirements. Aviation operations of the new squadrons and all other aviation units using the training areas would be conducted in accordance with applicable SOPs or have appropriate waivers in place.

Aircraft Safety

This issue was addressed in Chapter 3 in response to concerns expressed during the scoping process about the MV-22 safety record. The scope of this concern is the Marine Corps aviation program. Mishap data is maintained system-wide by the Navy Safety Center. In comparing Class A mishap data among Marine Corps aircraft (see Section 3.10.3.3), the MV-22 compares favorably with an overall Class A mishap rate of 3.32 per 100,000 flight hours, which is below the average rate for three of the four other aircraft that have been in operation for decades (H-46, CH-53E, CH-53D, AV-8B). The 3.32 rate includes the period when the MV-22 was in its developmental/test flight stage. Since returning to operational status in 2004 after undergoing design changes, the MV-22 has experienced one Class A mishap for a rate of 1.12 per 100,000 flight hours.

Bird Aircraft Strike Hazard (BASH)

The ROI for BASH is site-specific, mainly the airfield or other facility where aviation operations occur. BASH poses a cumulative safety risk to aircrews and aircraft, as well as ESA- and MBTA-listed bird species that frequent airfields. (See discussion in Section 5.3.7). BASH risk may increase with the higher number of operations by all users at most of the airfields and training areas. Existing preventive actions are designed to avoid or minimize BASH. MCB Hawaii follows a BASH Plan (June 2006) to manage the risk and contracts USDA Wildlife Services for BASH control. USAG-HI implements a BASH prevention program at DMR and Bradshaw Army Airfield at PTA and contracts USDA Wildlife Services for BASH control. PMRF follows a BASH Plan for the base and relies on USDA Wildlife Service's BASH control measures. Kalaupapa Airport is under State DOT Airports management and receives guidance from USDA Wildlife Services. Given these measures, no mitigation is required.

Wildland Fire

The ROI for wildland fires is site-specific. The concern centers around MV-22 aircraft during landing, take off, and while on the ground with engines running, and the increased frequency of aviation operations by all units at the training areas. In addition, fire risk is enhanced at certain sites subject to drought conditions, such as PTA. Any fire in native vegetation is considered detrimental, as it accelerates the conversion of native-dominated communities to non-native dominated communities (USAG-HI 2010). The increased frequency of training operations, particularly in areas with high risk factors, contributes to the potential for cumulative wildland fire impacts and the spread of invasive species.

Exhaust deflectors on the MV-22 are designed to minimize fire risk (see Appendix F-1). Furthermore, the MV-22 would operate mainly at paved airfields and LZs. The exception would be unpaved LZs at SBER, KLOA, and KTA, but these LZs are maintained to be clear of vegetation. All aviation units are subject to existing wildland fire management and response protocols for training and ranges, including installation-specific requirements (for example, MCB Hawaii's Base Order 3000.1B). Accordingly, the potential for cumulative wildland fire impacts is considered to be minor.

5.3.10 SOCIOECONOMICS

The geographic scope of the socioeconomic cumulative analysis includes communities adjacent to MCB Hawaii Kaneohe Bay and the training areas, and, for economic impacts, the state of Hawaii. Impacts are based on changes or relocation of personnel and/or construction spending in support of improvements at the military installations. In Chapter 3, both current and likely future conditions in the communities near MCB Hawaii Kaneohe Bay and the training areas were considered in assessing impacts. The account of population, housing impacts, and demand for community facilities in Chapter 3 is cumulative.

The proposed training operations outside MCB Hawaii Kaneohe Bay do not include any change in personnel at the subject installations and involve relatively small-scale construction activity. The proposed action would have little or no socioeconomic effect on nearby communities at these training areas. Moreover, the projects listed in Table 5-1 involve little or no change in the socioeconomic context for those communities, so no additional cumulative impacts are expected.

Construction. Proposed construction activities at MCB Hawaii Kaneohe Bay would occur from 2013 through 2017, and possibly later. Other major construction programs at the base that are more near-term include the P-8A aircraft facilities, Grow the Force projects, as well as base family housing replacement, repair, and renovations. The major portion of the family housing program construction is expected to be completed by 2015.

Impacts of construction spending on job-creation in the island economy are presented in Chapter 3. A possible cumulative impact on the local economy could arise if job creation associated with either of the action alternatives involves more jobs than the local workforce could fill, leading to labor in-migration and/or pressure for wage hikes.

Construction of facilities to support the VMM and HMLA squadrons would generate approximately 2,450 to 3,250 person-years of direct construction work (for Alternatives A and B, respectively) over some five years, for an average of 500 to 650 construction jobs in a given year. Since 1990, the construction job count in Hawaii has ranged from 36,100 (in 1991) to 28,800 (in 2010). Construction jobs are expected to increase to 35,500 by 2013 due to large infrastructure projects: the Honolulu rail system above all but also sewer work and other military projects. The projects supporting the new squadrons would contribute less than two percent of the total construction job count.

From 1990 to 2010, Hawaii's total job count grew by 20 percent to 586,900. At the end of that period, about 41,500 persons in the civilian labor force were unemployed, and the state unemployment rate was 6.5 percent. The increase in all civilian jobs associated with construction related to the proposed action—roughly 1,130 to 1,470 workers per year, in all direct, indirect, and induced construction-related jobs—would be less than four percent of the unemployed workforce. The short-term job growth associated with the project is too small to cumulatively affect employment and wages at the island or state level.

Operations. The basing of new aviation squadrons at MCB Hawaii Kaneohe Bay would involve construction of new quarters for unaccompanied Marines on base, and an increase in the number of families living off base. That increase would occur over about five years and could spread to other Oahu communities. This timing and potential dispersion would work to minimize cumulative impacts on the rental market and community life in the region.

The increase in demand for public services, notably for public school space, would similarly be spread out over a period of years and dispersed to several communities. Moreover, since the population in the Koolaupoko region surrounding MCB Hawaii Kaneohe Bay has been declining, competition for housing and public facilities has lessened slightly.

5.3.11 INFRASTRUCTURE

Roads and Traffic

The ROI considered in this analysis includes roadway systems within MCB Hawaii Kaneohe Bay and public roadways that provide access to the base. Increases in total traffic volumes from new projects can have cumulative impacts to the public roadway system. The proposed action would increase the number of personnel on the base, thus increasing the number of vehicles on roadways. A cumulative traffic assessment, which combined the GTF initiative with the proposed action, was conducted for MCB Hawaii Kaneohe Bay and is discussed in Chapter 3.12.1 with a detailed traffic assessment provided in Appendix I-1.

Construction-related activities associated with the proposed action would not cumulatively impact the roadway system since construction traffic is temporary, without long-term effects. Construction-related impacts could be minimized by making an effort to limit road closures to off-peak hours. Three intersections on the base could be affected during operations by the combined MV-22/H-1 and GTF initiatives: the Mokapu Road/G Street/Lawrence Road intersection, the C Street/Mokapu Road/Reed Street intersection, and the Craig Avenue and Selden Street intersection. With implementation of the proposed mitigation measures, cumulative impacts to these intersections would be decreased. No cumulative off-base traffic impacts were identified in the traffic assessment, as the roadways surrounding the base have available capacity.

Infrastructure and Utilities

Potable Water System. The geographic scope for the potable water cumulative analysis is the Windward Oahu region from Waimanalo to Punaluu, which includes the Honolulu Board of Water Supply (BWS) Kailua water system that services MCB Hawaii Kaneohe Bay. Cumulative effects would be those from the proposed action, other on-base projects and programs, and off-base development. Increased water usage due to primarily military and dependent population increases related to the proposed action would be added to other changes in regional water usage. Existing base and BWS systems are adequate to accommodate projected increases in water usage. Other cumulative projects on and off the base would be accommodated and required to comply with BWS management plans and connection/service requirements.

The socioeconomic analysis (Table H-2 of Appendix H) notes that the Kailua and Kaneohe population decreased between 2000 and 2010, with the 2020 projected population expected to remain below 2000 levels. Housing units in the area are projected to increase only slightly. Student population has been decreasing, reflecting these population trends. The increase in population due to the proposed action is expected to be distributed among the base, the Kailua-Kaneohe area, and elsewhere on the island of Oahu (see Table 3-22. Anticipated Housing Demand by Local Area). Thus, cumulative/regional water usage impacts to the Kailua-Kaneohe water system are not expected to be significant.

Current trends are to reduce water consumption both on and off the base. Navy and Marine Corps practices and standards being applied to construction of new and renovated facilities, including LEED and LID design criteria to achieve water conservation and use reduction, would serve to further minimize or reduce water consumption. Significant potable water use reduction could also be achieved through increased reuse of treated wastewater effluent for irrigation.

Wastewater System. The geographic scope for wastewater is the Kailua-Kaneohe area served by the Kailua regional wastewater treatment facility and its ocean outfall discharge. Cumulative wastewater impacts would be similar to that for potable water. Wastewater generation is based on a population or per capita basis. The downward population trend for Kailua-Kaneohe relates to reduced sewage discharge. The City and County of Honolulu has been steadily replacing or upgrading its old sewer collection systems. This would help to control or reduce overall wastewater flow to treatment and disposal facilities. Navy and Marine Corps efforts to reduce base potable water consumption would result in reduced wastewater generation, and the eventual increased reuse of treated effluent for irrigation at the base would significantly reduce discharge of wastewater to the outfall. Therefore, no significant cumulative effects are expected from on-base and regional development on wastewater systems and ocean discharge of treated effluent.

Solid Waste. The geographic scope for cumulative analysis of solid waste disposal includes MCB Hawaii Kaneohe Bay and the island of Oahu. On-base industrial solid waste, which includes industrial/commercial waste generated by the base, except family housing is received at the base's sanitary landfill. Solid waste generated from MCB Hawaii Kaneohe Bay family housing areas and off-base municipal solid wastes are received at the City and County of Honolulu's H-POWER waste-to-energy facility and Waimanalo Gulch Landfill. Construction and demolition waste, if unable to be recycled on-site, is received at the PVT Landfill.

The total municipal solid waste handled by H-POWER and the Waimanalo Gulch Landfill is 3,030 tons per day. H-POWER is currently operating at capacity, receiving 1,640 tons per day of combustible waste. Excess solid waste and solid waste not compatible for use as fuel at H-POWER, including commercial waste, bulky waste, and other municipal solid waste, are sent to the Waimanalo Gulch Landfill (City 2008). The Waimanalo Gulch Landfill, currently the only permitted municipal solid waste (MSW) landfill on Oahu, receives approximately 930 tons of municipal solid waste per day and approximately 460 tons of ash and residue per day from H-POWER.H-POWER capacity is being increased by about 50 percent, which would reduce the amount of solid waste being diverted to the landfill.

The PVT Landfill accepts approximately 200,000 tons of construction and demolition debris per year; a portion of the waste is sorted and recycled. Life expectancy of the PVT Landfill is anticipated to be 10 to 15 years, depending on the level of construction activities in the near future.

Current recycling programs at MCB Hawaii Kaneohe Bay divert a significant amount of material (4,468 tons compared to 2,570 tons deposited at the base landfill from July 2009 to June 2010) from the waste stream. On-site recycling programs include material recycled by the MCB Hawaii Recycling Center, green waste, material recycled from various construction projects, material reused through the Defense Reutilization and Marketing Office (DRMO), and recycled bulk food waste and cardboard from the base commissary. EO 13514 requires that at least 50 percent of non-hazardous solid waste be diverted from the MCB Hawaii Kaneohe Bay Sanitary Landfill.

Similar initiatives emphasizing recycling and solid waste diversion are being implemented at other Hawaii military installations and by the State of Hawaii, the City and County of Honolulu, and the private sector. The increase of H-POWER capacity would reduce the amount of solid waste being diverted to the Waimanalo Gulch Landfill. With these initiatives, there would be no significant cumulative effects from on-base, regional, and island-wide development on solid waste disposal facilities.

Electrical System. The geographic scope for the cumulative analysis of the electrical system includes MCB Hawaii Kaneohe Bay and the island of Oahu. HECO power plants and H-POWER generate nearly all of the power for Oahu. Net power consumption due to the proposed action is expected to have little impact on the HECO power grid. Base programs to reduce energy consumption and practices to design energy saving features into new and renovated facilities would contribute to limit or reduce power consumption at MCB Hawaii Kaneohe Bay. One program is the ongoing reconstruction and major renovation of base family housing (completion scheduled for 2014), which includes solar hot water systems, electrical metering, and implementation of the base RECP (Resident Energy Conservation Program) starting in 2011. Solar hot water, solar power (photovoltaic), and other energy-saving features are being incorporated base-wide in renovation and new construction projects (Nutting 2010). Similar initiatives are being implemented at other military installations in Hawaii. Increased emphasis on energy conservation and alternative energy sources by HECO, the State, the County, and private sector are all expected to reduce power usage islandwide. Therefore, no significant cumulative effects are expected on the island's electrical systems.

5.3.12 ENERGY USE

Since the ROI for energy use is island wide, energy-related impacts are cumulative. Energy usage reduction and conservation, as well as increased use of alternative/renewable energy sources, are mandated by federal and DoD directives. Navy and Marine Corps policies and programs are in place to implement such mandates. Section 3.13.1 lists federal directives on energy use. The U.S. Marine Corps Expeditionary Energy Strategy announced in March 2011 states the following:

- Reduce Energy Intensity. From 2003 to 2015, we will reduce our energy intensity at installations by 30 percent. To date, we have achieved a 9.5-percent reduction. We will focus broadly across the range of facilities, utility systems, and equipment pools. We will meet our goal through a combined effort of eliminating waste through upgrades and retrofits, performing energy audits and recommissioning energy consuming systems, demolishing inefficient infrastructure, and constructing new installations that incorporate energy saving features. We will employ metering, energy load planning, and micro-grid applications to optimize energy sources and reduce costs.
- Reduce Water Consumption. Through 2020, we will reduce our water consumption by two percent annually using water awareness campaigns and water saving devices and replacing inefficient utility systems.
- Increase Alternative Energy. By 2020, we will increase the amount of alternative energy consumed at installations to 50 percent of total energy consumption. Through the

combination of aggressive demand reduction and on-installation renewable energy production, we will transform half of our installations into net-zero energy consumers.

- Reduce Non-Tactical Petroleum Use. By 2015, we will reduce the amount of petroleum used in the commercial vehicle fleet by 50 percent through the phased adoption of hybrid, electric, alternative, and flex-fuel vehicles. Included in this effort is the infrastructure required to refuel and maintain the vehicle fleet. This goal also applies to installations that use petroleum for heating and electrical power production.

Through the implementation of the above federal and Marine Corps mandates, as well as local MCB Hawaii Kaneohe Bay programs and initiatives by HECO, state and city governments, and others, cumulative impacts on the island's energy use would be reduced in the foreseeable future.

One issue not addressed by these directives is the cumulative increase in tactical petroleum use by the Marine Corps and other services associated with the increased frequency of aviation training operations. This cumulative impact is identified as an irreversible commitment of a nonrenewable resource.

CHAPTER 6

Impacts Summary

Impacts Summary

This section provides an overview of potential environmental impacts associated with each proposed action alternative and the No Action Alternative. A summary of impacts and proposed mitigation measures disclosed in Chapters 3 and 4 is presented in the tables in this chapter. The tables are organized by geographic area and by resource, starting with Marine Corps Base (MCB) Hawaii Kaneohe Bay and followed by the training areas. Impacts during construction and operations are identified. (Note that construction is not proposed at every training area.)

The differences in impacts between Alternatives A and B are due to variations in the proposed development projects at MCB Hawaii Kaneohe Bay, as follows:

- Locating the MV-22 facilities at West Field, as proposed under Alternative B, would require construction of a runway underpass. Impacts associated with excavation may include disturbance of subsurface archaeological resources or findings of disturbed human remains in sand fill, and generation of a large amount of solid waste requiring disposal. Reuse/recycling of excavated material could address the solid waste disposal issue.
- The Alternative B (West Field) site for MV-22 facilities is in a flood hazard area subject to inundation by the 100-year flood. It is also within the tsunami evacuation zone. Development within the floodplain would require mitigation.
- There would be different impacts on archaeological resources at the areas proposed for development of MV-22 facilities. Archaeological testing at the Alternative A site revealed no features, artifacts, or human remains within the approximately 30-acre (ac) (12-hectare [ha]) area (IARII 2011). Most of the Alternative B site proposed for MV-22 facilities falls within an area of filled land that presents almost no probability of encountering cultural resources. However, the eastern edge of the area of potential effects (APE) lies within the NRHP eligible Mokapu House Lots Historic District, and the southern edge of the APE includes three of the early 20th century house sites.
- For the MV-22 facilities under Alternative B, ten National Register of Historic Places (NRHP)-eligible buildings would be demolished. No NRHP-eligible buildings are proposed for demolition for the MV-22 facilities in Alternative A.
- Options for the Bachelor Enlisted Quarters (BEQ), eligible for listing in the NRHP, include either demolishing all six existing buildings and constructing three new four-story facilities (Alternative A), or demolishing four existing buildings, retaining two existing BEQs, and constructing two new six-story facilities (Alternative B). Alternative A would result in a larger amount of demolition waste requiring disposal.

For a number of resources, there would be no impact or minor impacts. Many impacts regardless of the action alternative selected would be avoided or minimized through implementation of existing management measures in compliance with applicable laws, regulations, orders, and standard/standing operating procedures (SOPs) (see Sections 2.6 for more information).

Mitigation is required for only a small number of resource areas, which the Marine Corps would be responsible for implementing. With mitigation, those impacts would no longer be significant. No unmitigatable impacts have been identified.

Mitigation is proposed or may be needed for the following:

- Impacts on NRHP-eligible or listed buildings at MCB Hawaii Kaneohe Bay proposed for renovation or demolition (Alternatives A and B): mitigation will be determined and included in the Programmatic Agreement (PA) prepared as part of the National Historic Preservation Act (NHPA) Section 106 consultation process.
- Impacts on archaeological Site 4933 (Alternatives A and B) and the NRHP eligible Mokapu House Lots Historic District (Alternative B only) during construction at MCB Hawaii Kaneohe Bay: mitigation will be determined and included in the PA.
- Impacts on possible human skeletal remains in disturbed context (sand fill) during construction at MCB Hawaii Kaneohe Bay (Alternatives A and B): mitigation will be determined and included in the PA.
- Impacts on subsurface archaeological deposits during construction of LZ improvements at Marine Corps Training Area Bellows (MCTAB): requirement for mitigation would depend if the depth of ground disturbance exceeds 12 inches (in) (30 centimeters [cm]); mitigation will be determined and included in the PA.
- Impacts on archaeological resources from MV-22 downwash at selected LZs at Kahuku Training Area (KTA), Kawailoa Training Area (KLOA), and PTA that have not been completely surveyed: additional archaeological surveys prior to use by MV-22 aircraft; mitigation will be determined and included in the PA.
- Traffic impacts at MCB Hawaii Kaneohe Bay: widen an approach to provide separate lanes at one affected intersection, install an additional right turn lane at another intersection, and restripe an approach to provide a separate lane at another intersection. Improve procedures at the entry gates to increase efficiency and capacity.
- Soil erosion at unpaved landing zones (LZs) at Schofield Barracks East Range (SBER) and parts of the Kawailoa Training Area (KLOA) due to MV-22 downwash: monitor conditions at the relevant SBER and KLOA LZs. Should field observations verify that

erosion is occurring, the Marine Corps would work with the range manager to implement appropriate repairs or other maintenance actions.

Table 6-1 through Table 6-8 provide summaries of impacts by resource. Each installation or training area is shown in its own table.

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
Land Use			
Land Use Compatibility	Operations. Changes in aircraft noise levels at noise sensitive areas would be small--ranging from 1.3 to 3.0 DNL compared to baseline, and from 0.3 to 1.1 DNL compared to No Action. Fixed wing aircraft would continue to be primary contributors to noise in the environs.	Operations. Same as Alternative A.	Operations. Minimal changes in aircraft noise levels compared to baseline, ranging from 0.2 to 2.7 DNL; fixed wing aircraft would continue to be primary contributors to noise in the environs.
	Mitigation: *None*	*Mitigation*: *None*	*Mitigation*: None.

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
Aesthetics/ Visual Resources	Operations. Development of new facilities and increase in aviation operations (more aircraft landings/takeoffs) would change the appearance of the base from various off-base viewpoints. Views would generally be similar to existing conditions. Views of the ocean and mountains from the base would remain relatively unchanged. (Impacts on historic buildings are summarized in the Cultural Resources section.)	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation*: None	*Mitigation*: None
Quality of Built Environment	Operations. Proposed facilities would be consistent in design and appearance with existing facilities. (Impacts on historic building are summarized separately in the Cultural Resources section.)	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation*: None.	*Mitigation*: None.
Land Ownership	Operations. No change.	Operations. No change.	Operations. No change.
	Mitigation: None.	*Mitigation:* None.	*Mitigation:* None.
Public Access	Operations. No change.	Operations. No change.	Operations. No change.
	Mitigation: None.	*Mitigation:* None.	*Mitigation:* None.
Airspace	Operations. Total airfield operations would increase by approximately 49% compared to 2009. The proposed action would consist of 29% more operations than the No Action Alternative.	Operations. Same as Alternative A.	Operations. Total airfield operations would increase by approximately 15% compared to 2009.
	Mitigation: None	*Mitigation:* None	*Mitigation:* None
Noise	Construction. Unavoidable, temporary impacts limited mainly to the base; phased over 6-10 years. The use of quiet equipment and construction curfew periods would minimize impacts.	Construction. Same as Alternative A.	Construction. No change

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
	Operations. Changes in aircraft noise levels at noise sensitive areas would range from 1.3 to 3.0 DNL compared to baseline, and from 0.3 to 1.1 DNL compared to No Action. Fixed wing aircraft would continue to be primary contributors to noise in the environs.	Operations. Same as Alternative A.	Operations. Minimal changes in aircraft noise levels compared to baseline, ranging from 0.2 to 2.7 DNL; fixed wing aircraft would continue to be primary contributors to noise in the environs.
	Mitigation: *None*	*Mitigation*: *None.*	*Mitigation: None.*
Air Quality	Construction. Impacts would not be significant. Emissions would be short-term, and existing regulatory controls and requirements would minimize impacts.	Construction. Similar to Alternative A.	Construction. No change.
	Operations. Increases in stationary (generators) and mobile source emissions (aircraft and vehicles) would occur. Stationary source emissions would be controlled through the existing regulatory permit process that prevents significant impacts on air quality. In the case of mobile sources, emissions would be readily dispersed.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Geology, Soils, Topography	Construction. Construction activities would be conducted in compliance with project specific NPDES permit program. Excessive ground settlement, erosion, and expansive soil impacts are not anticipated with implementation of applicable geotechnical engineering practices.	Construction. Extensive excavation (approximately 140,000 cubic yards) would occur during construction of the runway underpass. Construction activities would be conducted in compliance with project specific NPDES permit program. Excessive ground settlement, erosion, and expansive soil impacts are not anticipated with implementation of applicable geotechnical engineering practices.	Construction. No change.
	Operations. No impacts.	Operations. No impacts.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
Drainage, Hydrology, Water Quality	Construction. Temporary construction impacts would be avoided or minimized through compliance with NPDES permit requirements.	Construction. Same as Alternative A.	Construction. No change
	Operations. An estimated 20-acre increase in impervious surfaces due to new facilities would slightly increase runoff (represents approximately 2.3% of the developed part of the base). Low Impact Development (LID) design would be implemented to the maximum extent feasible to maintain storm water discharge to pre-development hydrology levels.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation:* None.
Biological Resources	Construction. ESA-listed terrestrial plant species at MCB Hawaii Kaneohe Bay and endemic seagrass found offshore (not ESA-listed) are not in the vicinity of proposed construction. No wetlands or coral reefs are in the vicinity of proposed construction. Compliance with regulatory measures (BMPs) would prevent or minimize runoff into wetlands or offshore waters during construction.	Construction. Same as Alternative A.	Construction. No change

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
	Operations. ESA-listed terrestrial and marine faunal species and MBTA-listed birds have been observed at MCB Hawaii Kaneohe Bay. With existing natural resource management measures, proposed aviation activities would have no effect on these resources. BASH, invasive species, and wildland fire risks would be managed through compliance with applicable base orders, plans/policies, and SOPs. Outdoor lights of new facilities would be shielded when possible to minimize impacts on shearwaters.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None*	*Mitigation: None*
Cultural Resources			
Historic Buildings	Construction/Operations. Nine NRHP eligible facilities are proposed for renovation. Seven NRHP-eligible facilities are proposed for demolition, including six historic BEQs.	Construction/Operations. Nine NRHP eligible facilities are proposed for renovation. Fifteen NRHP-eligible facilities are proposed for demolition, including four historic BEQs.	Construction/Operations. No change.
	Mitigation: Documented in PA developed and executed during the NHPA Section 106 review process.	*Mitigation: Same as Alternative A.*	*Mitigation: None*

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
Archaeological Resources	Construction/Operations. Impacts on archaeological resources are possible during ground disturbance associated with construction. There is a potential for adverse effects on Site 4933 associated with the MALS composite shop, warehouse, and armory project. There is the potential for encountering disturbed human remains in sand fill during the construction projects. MV-22 rotor downwash impacts on archaeological sites at LZs are not likely.	Construction/Operations. Impacts on archaeological resources are possible during ground disturbance associated with construction. There is a potential for adverse effects on Site 4933 associated with the MALS composite shop, warehouse, and armory project. There is a potential for adverse effects on the Mokapu House Lots complex associated with the VMM facilities at West Field. There is the potential for encountering disturbed human remains in sand fill during the construction projects. MV-22 rotor downwash impacts on archaeological sites at LZs are not likely.	Construction. No change
	Mitigation: Documented in PA developed and executed during the NHPA Section 106 review process.	*Mitigation: Same as Alternative A.*	*Mitigation: None*
Safety and Environmental Health			
Natural Hazards	Operations. New facilities would not be located within the tsunami evacuation zone and Flood Hazard Area subject to inundation by the 100-year flood. New facilities would be designed in accordance with applicable seismic design criteria requirements.	Operations. MV-22 facilities at West Field would be within the tsunami evacuation zone and Flood Hazard Area subject to inundation by the 100-year flood. In case of a tsunami warning, personnel would follow natural disaster preparedness and evacuation procedures. New facilities would be designed in accordance with applicable seismic design criteria requirements.	Operations. No change
	Mitigation: None.	*Mitigation: Necessary for MV-22 facilities located within the Flood Hazard Area.*	*Mitigation: None.*

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
Hazardous Materials/Waste	Construction. Three IRP sites are located near the proposed MALS facility. One IRP site is located in the vicinity of Bldg 4088, to be renovated and expanded. Another IRP site is located near the proposed MV-22 apron. No USTs or ASTs are located in areas where construction is planned. Construction would be carried out in compliance with applicable regulatory requirements and SOPs, including the base's Spill Prevention, Control and Countermeasure Plan and Integrated Contingency Plan.	Construction. Same as Alternative A, except for the MV-22 project (no IRP site at West Field).	Construction. No change
	Operations. Squadrons would comply with the base's Hazardous Waste Management Plan and other SOPs to avoid/minimize impacts during operations.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Airfield Safety	Operations. All new facilities would meet airfield safety requirements for runway clear zones, accident potential zones, and transitional surfaces. The runway at MCB Hawaii Kaneohe Bay meets MV-22 airfield requirements for a basing location, including requirements for night training, instrument procedures, local runway pattern work, and runway and overrun lengths.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
Aircraft Safety	Operations. For FY11, the MV-22 has a Class A flight mishap rate of 3.32 (per 100,000 hours), which includes developmental/ test flights between 1999 to 2001. Since 2004, after design changes, the MV-22 has had a mishap rate of 1.12 Both mishap rates are below average, reflecting a favorable safety record. H-1 aircraft mishap rates between FY99 to FY11 are 3.03 for the UH-1 and 2.55 for the AH-1.	Operations. Same as Alternative A.	Operations. Not applicable
	Mitigation: None	*Mitigation: None.*	*Mitigation: None*
Bird Aircraft Strike Hazard	Operations. BASH risk is managed through compliance with MCB Hawaii's BASH Plan. The base contracts with USDA Wildlife Services for BASH control.	Operations Same as Alternative A.	Operations. Some change due to reduction in air operations with one HMH squadron.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*
Wildland Fires	Operations. Little or no impact as MV-22 aircraft would land at and take off from the airfield and paved LZs kept clear of vegetation. Exhaust deflectors on the MV-22s would minimize fire risk; they are deployed during landings and take-offs and while on the ground with engines running at undeveloped sites. The squadrons would be subject to existing wildland fire management and response protocols for training and ranges contained in MCB Hawaii's Base Order 3000.1B.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Ordnance Safety	Operations. All facilities and operations would occur outside existing ESQD arcs. The squadrons would operate in accordance with the base's ordnance safety requirements.	Operations. Same as Alternative A.	Operations. No change

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Socioeconomics			
Demographics	Operations. A small increase in population on-base and in Oahu communities is projected over several years.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Housing	Operations. Demand for housing at MCB Hawaii Kaneohe Bay and in the surrounding community would gradually increase over several years.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None	*Mitigation: None*	*Mitigation: None.*
Employment and Wages	Construction. Jobs would be created on-base and throughout the local economy.	Construction. Same as Alternative A.	Construction. No change
	Operations. Increase in personnel would support modest increase of jobs to support them.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Labor Force Impacts	Construction. New jobs would support local construction workforce.	Construction. Same as Alternative A.	Construction. No change
	Operations. New jobs could be filled by local population	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Fiscal Impacts	Construction. Gain in revenue from taxes on construction is projected.	Construction. Same as Alternative A.	Construction. No change
	Operations. Gain in revenue from taxes and fees is projected.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Community Organization	Operations. Little change.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
Public Facilities and Services	Operations. Families would add to demand for public schools, but enrollments at schools serving the base have declined; local schools could handle new demand.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Environmental Justice	Operations. Competition for rental housing would affect low-income populations, but impact would be gradual and diffuse, not limited to or targeting EJ communities.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*
Protection of Children	Operations. No health/safety risks have been identified that would adversely affect children.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Infrastructure			
Roadways and Traffic	Operations. All base intersections except three would operate at acceptable levels of service. Increased traffic at entry gates and at the runway crossing may decrease efficiency.	Operations. Same as Alternative A.	Operations. All intersections except one would operate at acceptable levels of service.
	Mitigation: Widen the eastbound approach at G Street, Lawrence Street, and Mokapu Road. Install an additional right turn lane on southbound Reed Road at the intersection with Mokapu Road. Restripe the southbound approach at Selden and Craig Avenue to provide a separate right turn lane. Improve gate procedures to increase capacity and efficiency.	*Mitigation:* Same as Alternative A.	*Mitigation:* Restripe the intersection of Selden Street and Craig Avenue.
Public Transit	Operations. Public transit operations including TheBus and Handivan services are unlikely to reach capacity.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation:* None.	*Mitigation:* None.

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
Potable Water	Operations. Projected increases in on-base and off-base water usage would be minimal; existing systems have adequate capacity.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Wastewater	Operations. Projected increases in on-base and off-base wastewater discharge would be minimal; existing systems have adequate capacity.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Solid Waste	Construction. Construction solid waste would be recycled or disposed of off-base at the PVT Landfill. Construction/demolition waste from the proposed action would be an estimated 0.5 percent of waste currently being disposed of annually at the landfill. The BEQ project would generate slightly more waste under Alternative A than Alternative B, with the demolition of six buildings as compared to four.	Construction. Same as Alternative A, except for slightly less solid waste associated with BEQ demolition.	Construction. No change
	Operations. There would be an estimated 9 percent increase in solid waste disposed of at the MCB Hawaii Kaneohe Bay Landfill. Landfill capacity is adequate (projected landfill life would be 35-40 years, compared to current 48-year estimate). Current recycling programs divert a significant amount of material from the waste stream. Projected off-base solid waste would increase by approximately 0.3 percent. Planned increase in H-Power capacity by about 50 percent would substantially decrease the amount of waste diverted to the municipal landfill.	Operations. Same as Alternative A.	Operations. No change

Table 6-1. Summary of Impacts for MCB Hawaii Kaneohe Bay

Resource	Alternative A	Alternative B	No Action Alternative
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*
Electrical	Operations. Impacts would be negligible; HECO could accommodate the projected small load increases. Projects would incorporate design features to reduce energy use, such as photovoltaic systems.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Telephone and Cable	Operations. Communications systems would be assessed and upgrades would be incorporated into planned facilities.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Energy Use	Construction. To the extent practicable, water conservation devices, solar heating, solar power, and other energy reduction features such as insulation would be incorporated into facility design to reduce energy consumption, life cycle costs, and emissions. Operations. The base expects a 15.5% reduction in energy intensity from 2003 to 2015.	Construction. Same as Alternative A. Operations. Same as Alternative A.	Construction. No change Operations. The base expects 12.5% reduction in energy intensity from 2003 to 2015.
	Mitigation: None	*Mitigation:* None	*Mitigation:* None

Table 6-2. Summary of Impacts for Marine Corps Training Area Bellows

Resource	Alternative A	Alternative B	No Action Alternative
Land Use			
Land Use Compatibility	Operations. No areas outside of MCTAB would experience aircraft sound levels equal to or greater than 65 dB DNL.	Operations. Same as Alternative A.	Operations. Same as Alternative A.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-2. Summary of Impacts for Marine Corps Training Area Bellows

Resource	Alternative A	Alternative B	No Action Alternative
Aesthetics/ Visual Resources	Operations. Views of MCTAB from the public highway and nearby parks are obscured by vegetation. Aircraft landing at and taking off from MCTAB would be visible from various off-base viewpoints. Views of the installation would be similar to existing conditions.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Quality of Built Environment	Operations. Not applicable; no vertical construction is proposed.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Land Ownership	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Public Access	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airspace	Operations. Marine Corps annual air operations would roughly double at MCTAB compared to 2009; this is approximately 209% more operations than No Action.	Operations. Same as Alternative A.	Operations. Marine Corps air operations would decrease by almost 40% with reduction to two HMH squadrons.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Air Quality	Construction. Impacts would not be significant because emissions would be short-term, and existing controls and requirements would minimize impacts.	Construction. Same as Alternative A.	Construction. No change.
	Operations. Increases in mobile source emissions (aircraft) would occur. Mobile source emissions would be readily dispersed and unlikely to impact National or State AAQS.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*

Table 6-2. Summary of Impacts for Marine Corps Training Area Bellows

Resource	Alternative A	Alternative B	No Action Alternative
Noise	Construction. Negligible impacts (minor construction).	Construction. Same as Alternative A.	Construction. No change
	Operations. No areas outside of MCTAB would experience aircraft sound levels equal to or greater than 65 dB DNL.	Operations. Same as Alternative A.	Operations. Same as Alternative A.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Geology, Soils, Topography	Construction. Minimal, temporary impacts. BMPs would be implemented for erosion and sediment control.	Construction. Same as Alternative A.	Construction. No change
	Operations. Little or no erosion impact due to downdraft since the LZs at MCTAB would be paved.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Drainage, Hydrology, Water Quality	Construction. Minimal, temporary impacts. BMPs would be implemented for erosion and sediment control.	Construction. Same as Alternative A.	Construction. No change
	Operations. Little or no impact given negligible increase in impervious surfaces (less than 0.1% of total training area).	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation:* None.

Table 6-2. Summary of Impacts for Marine Corps Training Area Bellows

Resource	Alternative A	Alternative B	No Action Alternative
Biological Resources	Construction. No ESA-listed plant species are recorded at MCTAB. No wetlands are in the vicinity of LZs to be improved, and none of the LZs are located along the shoreline close to coastal waters. Compliance with BMPs would prevent or minimize runoff outside construction sites.	Construction. Same as Alternative A.	Construction. No change
	Operations. Five ESA-listed bird species (including four endangered native waterbirds) and 25 MBTA-listed bird species are recorded at MCTAB. The waters off MCTAB are home to five ESA-listed marine species. Management practices are in place to protect ESA-listed and MBTA-listed species, minimize BASH risk, control/ prevent the transport of invasive species, and prevent wildfires. The proposed training would have no effect on protected species.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Cultural Resources			
Historic Buildings	Construction. No change	Construction. No change	Construction. No change
	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Archaeological Resources	Construction. Subsurface archaeological deposits are within the APE of three LZs.	Construction. Same as Alternative A.	Construction. No change
	Operations. Rotor downwash is not expected to cause impacts to subsurface archaeological deposits within the APE because of their depth below surface and dense vegetative cover.	Operations. Same as Alternative A.	Operations. No change

Table 6-2. Summary of Impacts for Marine Corps Training Area Bellows

Resource	Alternative A	Alternative B	No Action Alternative
	Mitigation: Determined in the NHPA Section 106 consultation process and included in the PA, would depend upon the depth of ground disturbance during construction (>12 in or 30 cm deep).	*Mitigation: Same as Alternative A.*	*Mitigation: None*
Safety and Environmental Health			
Natural Hazards	Construction/Operations. Two existing LZs to be improved are within the 100-year floodplain. No habitable structures are proposed.	Construction/Operations. Same as Alternative A.	Construction/Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Hazardous Materials/Waste	Construction. Construction would be carried out in compliance with applicable regulatory requirements and SOPs, including the base's Spill Prevention, Control and Countermeasure Plan and Integrated Contingency Plan.	Construction. Same as Alternative A.	Construction. No change
	Operations. Squadrons would comply with the base's Hazardous Waste Management Plan and other SOPs to avoid/minimize impacts during training.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airfield Safety	Operations. Training would occur at existing LZs designed to meet DoD requirements. Aviation operations could be carried out in compliance with applicable SOPs.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None*	*Mitigation: None*
Bird Aircraft Strike Hazard	Operations. BASH risk is managed through compliance with aviation SOPs.	Operations. Same as Alternative A.	Operations. Less BASH risk due to reduction in air operations with one HMH squadron.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*

Table 6-2. Summary of Impacts for Marine Corps Training Area Bellows

Resource	Alternative A	Alternative B	No Action Alternative
Wildland Fires	Operations. Little or no impact as MV-22 aircraft would land at and take off from paved LZs kept clear of vegetation. Exhaust deflectors on the MV-22s would minimize fire risk; they are deployed during landings and take-offs and while on the ground with engines running at undeveloped sites. The squadrons would be subject to existing wildland fire management and response protocols for training and ranges contained in MCB Hawaii's Base Order 3000.1B.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Ordnance Safety	Operations. Not applicable; no ordnance is stored at MCTAB.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Socioeconomics			
Environmental Justice	Operations. No disproportionate impact on minorities or low-income communities.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Protection of Children	Operations. No health/safety risks have been identified that would adversely affect children.	Operations. Same as Alternative A.	Operations.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Energy Use	Construction. Minor increase in energy use	Construction. Same as Alternative A.	Construction. No change
	Operations. Increased use of fuel for aircraft, to include biofuels.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-3. Summary of Impacts for Army Training Areas on Oahu

Resource	Alternative A	Alternative B	No Action Alternative
Land Use			
Land Use Compatibility	Operations. No impacts to noise sensitive receptors due to training at KTA; operations would be consistent with existing land uses. At DMR, no areas outside of the installation would experience sound levels equal to or greater than 65 dB DNL. At KLOA, the 65 dB DNL contour would not extend more than 1,000 feet in any direction from the LZ. At SBER, the 65 dB DNL contour would not extend more than 200 feet from the LZ.	Operations. Same as Alternative A.	Operations. No noise compatibility impacts at KTA. At DMR, same as Alternative A. At KLOA, the 65 dB DNL contour would not extend more than 400 feet in any direction from the LZ. At SBER, aircraft noise would be insufficient to generate a DNL of 65 dB.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Aesthetics/ Visual Resources	Operations. The LZs at SBER, KLOA, and KTA are in remote areas; DMR is in the vicinity of the Mokuleia/Waialua communities. Aircraft in transit and training in these areas may be visible from various viewpoints, similar to existing conditions.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Quality of Built Environment	Operations. Not applicable (no construction proposed)	Operations. Same as Alternative A.	Operations. Not applicable (no construction proposed)
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Land Ownership	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Public Access	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-3. Summary of Impacts for Army Training Areas on Oahu

Resource	Alternative A	Alternative B	No Action Alternative
Airspace	Operations. Total annual air operations at KTA, KLOA, and SBER would increase slightly—approximately 1% more annual operations than No Action. About 25% of these operations would be attributed to Marine Corps aircraft. At DMR, there would be approximately 2% more annual operations compared to No Action. About 2% of DMR operations are attributed to Marine Corps aircraft.	Operations. Same as Alternative A.	Operations. Marine Corps air operations would decrease slightly with reduction to two HMH squadrons.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*
Noise	Operations. No impacts to noise sensitive receptors due to training at KTA. At DMR, no areas outside of the installation would experience sound levels equal to or greater than 65 dB DNL. At KLOA, the 65 dB DNL contour would not extend more than 1,000 feet in any direction from the LZ. At SBER, the 65 dB DNL contour would not extend more than 200 feet from the LZ.	Operations. Same as Alternative A.	Operations. No noise compatibility impacts at KTA. At DMR, same as Alternative A. At KLOA, the 65 dB DNL contour would not extend more than 400 feet in any direction from the LZ. At SBER, aircraft noise would be insufficient to generate a DNL of 65 dB.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Air Quality	Construction. None.	Construction. Same as Alternative A.	Construction. No change.
	Operations. Increases in mobile source emissions (aircraft) would occur. Mobile source emissions would be readily dispersed and unlikely to impact National or State AAQS.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-3. Summary of Impacts for Army Training Areas on Oahu

Resource	Alternative A	Alternative B	No Action Alternative
Geology, Soils, Topography	Operations. MV-22 downdraft could cause soil erosion at unpaved LZs. Soils at SBER and certain parts of KLOA have relatively high erosion potential.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: Monitor conditions at SBER and KLOA LZs.	*Mitigation: Monitor conditions at SBER and KLOA LZs.*	*Mitigation: None*
Drainage, Hydrology, Water Quality	Operations. These are existing training areas; no additional impervious areas are being added. No changes to drainage, hydrology or water quality.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Biological Resources	Operations. No ESA-listed plant species are documented within or near LZs proposed for training. ESA-listed faunal species are documented at SBER, KLOA, and DMR. MBTA-listed species have been observed at KTA, KLOA, SBER, and DMR. No ESA- or MBTA-listed species had been previously recorded in the vicinity of the subject LZs. Presence of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) has been confirmed at LZ Elephants Foot at KLOA, and possibly (probable but not confirmed) at LZ Ku Tree at SBER. Natural resource management programs are in place through the Army's Oahu INRMP and MCB Hawaii's INRMP. DoN determined and USFWS concurred that training activities "may affect but are not likely to adversely affect" the Hawaiian hoary bat.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: No additional mitigation required given compliance with existing conservation measures to avoid/minimize impacts.	*Mitigation: Same as Alternative A.*	*Mitigation: None*

Table 6-3. Summary of Impacts for Army Training Areas on Oahu

Resource	Alternative A	Alternative B	No Action Alternative
Cultural Resources			
Archaeological Resources	Operations. At DMR, archaeological sites within the APEs are surface structures (revetments) that would not be affected by MV-22 downwash. No archaeological sites have been identified within the APE at KTA, KLOA, or SBER. There is potential for encountering surface and subsurface features at certain LZs at KTA and KLOA where archaeological surveys have not been complete. The extent of impacts due to MV-22 downwash would depend on the location and depth of such features.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: Additional archaeological surveys will be conducted at LZs where previous surveys were not completed by the Army, as documented in the PA developed and executed as part of the NHPA Section 106 review process.	*Mitigation: Same as Alternative A.*	*Mitigation: None*
Safety and Environmental Health			
Natural Hazards	Operations. SBER, KLOA, and KTA are in Zone D, where flood hazards are undetermined but possible. Much of the flat-lying area of DMR may be within the 100-year flood zone. The DMR flight line is in the tsunami evacuation zone. The island of Oahu is subject to earthquake activity. No construction is proposed at these training areas. Training activities would not be subject to substantive risk due to natural hazards; existing emergency preparedness plans would apply.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-3. Summary of Impacts for Army Training Areas on Oahu

Resource	Alternative A	Alternative B	No Action Alternative
Hazardous Materials/ Waste	Operations. Squadrons would comply with MCB Hawaii's Hazardous Waste Management Plan and other SOPs, including Army environmental requirements, to avoid/minimize impacts during training.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airfield Safety	Operations. Training would occur at existing LZs designed to meet DoD requirements. Aviation operations could be carried out in compliance with applicable SOPs.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Bird Aircraft Strike Hazard	Operations. BASH risk is managed through compliance with aviation SOPs. The Army implements a BASH prevention program at DMR with assistance from USDA Wildlife Services.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*
Wildland Fires	Operations. Exhaust deflectors on the MV-22s would minimize fire risk; they are deployed during landings and take-offs and while on the ground with engines running at undeveloped sites. The squadrons would be subject to existing wildland fire management and response protocols for training and ranges contained in MCB Hawaii's Base Order 3000.1B, as well as to applicable Army range requirements.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Ordnance Safety	Operations. Not applicable; no ordnance is stored at these training areas.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*

Table 6-3. Summary of Impacts for Army Training Areas on Oahu

Resource	Alternative A	Alternative B	No Action Alternative
Socioeconomics			
Environmental Justice	Operations. No disproportionate impacts are expected on minority or low-income populations.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Protection of Children	Operations. No health/safety risks have been identified that would adversely affect children.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Energy Use	Operations. Increased use of fuel for aircraft, to include biofuels.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-4. Summary of Impacts for Pohakuloa Training Area

Resource	Alternative A	Alternative B	No Action Alternative
Land Use			
Land Use Compatibility	Operations. PTA is in a remote area, far from noise sensitive receptors. No land use incompatibility would be triggered by aircraft training within the installation boundaries.	Operations. Same as Alternative A.	Operations. Marine Corps air operations would decrease with reduction to two HMH squadrons. No land use incompatibility would be triggered by aircraft training within the installation boundaries.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Aesthetics/ Visual Resources	Operations. PTA is in a remote area. Aircraft in transit and training in these areas would be visible from various viewpoints, and there would be some change associated with the increased number of operations. Views would be similar to existing conditions.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-4. Summary of Impacts for Pohakuloa Training Area

Resource	Alternative A	Alternative B	No Action Alternative
Quality of Built Environment	Operations. Not applicable; no vertical construction is proposed.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Land Ownership	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Public Access	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airspace	Operations. Total air operations at PTA would increase 75% compared to 2009. About 22% of these operations would be attributed to Marine Corps aircraft. There would be about 26% more total annual operations compared to No Action.	Operations. Same as Alternative A.	Operations. Marine Corps air operations would decrease by approximately a third with reduction to two HMH squadrons.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Noise	Construction. Little or no impact (no nearby noise sensitive receptors).	Construction. Same as Alternative A.	Construction. No change
	Operations. No adverse impact (no nearby noise sensitive receptors).	Operations. Same as Alternative A.	Operations. Marine Corps air operations would decrease with reduction to two HMH squadrons. No adverse impact (no nearby noise sensitive receptors).
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Air Quality	Construction. Impacts would not be significant because emissions would be short-term, and existing controls and requirements would minimize impacts.	Construction. Same as Alternative A.	Construction. No change.
	Operations. Increases in mobile source emissions (aircraft) would occur. Mobile source emissions would be readily dispersed and unlikely to impact National or State AAQS.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*

Table 6-4. Summary of Impacts for Pohakuloa Training Area

Resource	Alternative A	Alternative B	No Action Alternative
Geology, Soils, Topography	Construction. Soils erosion potential is low due to presence of rock at or near ground surface, as well as the dry climate and lack of stream beds. Minimal, temporary impacts. BMPs would be implemented as needed for erosion and sediment control.	Construction. Same as Alternative A.	Construction. No change
	Operations. Impact of aircraft downdraft would be minimal at Bradshaw Field and paved LZs. Erosion from downdraft may occur at unpaved LZs, but the risk would be relatively low given soils conditions.	Operations. Same as Alternative A.	Construction. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Drainage, Hydrology, Water Quality	Construction. Minimal, temporary impacts given low soil erosion potential and dry climate. BMPs would be implemented as needed for erosion and sediment control.	Construction. Same as Alternative A.	Construction. No change
	Operations. Little or no impact given negligible increase in impervious surfaces (0.001% of total training area).	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation:* None	*Mitigation:* None.
Biological Resources	Construction. LZs are characterized by ruderal vegetation and/or bare ground with remnant patches of native vegetation. DoN has determined "no effect" on two ESA-listed plants (creeping mint, *Stenogyne angustifolia*) recorded in the LZ Xray buffer area. No wetlands or critical habitat are located in the vicinity of subject LZs. Construction impacts would be minimal.	Construction. Same as Alternative A.	Construction. No change

Table 6-4. Summary of Impacts for Pohakuloa Training Area

Resource	Alternative A	Alternative B	No Action Alternative
	Operations. In the past 15 years, five ESA-listed (endangered) faunal species and eight MBTA-listed species have been recorded at PTA. The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) is known to occur at PTA. Surveys of the subject LZs conducted in April 2011 confirmed the Hawaiian hoary bat at 12 of the 18 LZs surveyed. The survey also recorded nene *(Branta sandvicensis)* at PTA, as well as MBTA-listed species. Natural resources management programs are in place through the PTA and MCB Hawaii INRMPs to protect listed species. DoN determined and USFWS concurred that training activities "may affect but are not likely to adversely affect" the Hawaiian hoary bat and the nene.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: No additional mitigation required given compliance with existing conservation measures to avoid/minimize impacts.	*Mitigation: Same as Alternative A.*	*Mitigation: None*
Cultural Resources			
Historic Buildings	Construction. No change	Construction. No change	Construction. No change
	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Archaeological Resources	Construction. No impacts; no archaeological sites have been identified within the Bradshaw Army Airfield APE.	Construction. Same as Alternative A.	Construction. No change

Table 6-4. Summary of Impacts for Pohakuloa Training Area

Resource	Alternative A	Alternative B	No Action Alternative
	Operations. Two archaeological sites have been recorded within the APEs, but the sites contain features that would not be vulnerable to downwash. There is potential for encountering surface and subsurface features at certain LZs where archaeological surveys have not been complete. The extent of impacts due to MV-22 downwash would depend on the location and depth of such features. See Section 4.9.3.6 for more information.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: Additional archaeological surveys will be conducted at LZs where previous surveys were not completed by the Army, as documented in the PA developed and executed as part of the NHPA Section 106 review process.	*Mitigation: Same as Alternative A.*	*Mitigation: None*
Safety and Environmental Health			
Natural Hazards	Construction/Operations. PTA is outside the 100-year floodplain, in Zone X (outside the 0.2% annual chance floodplain), and is not within the tsunami evacuation zone. Earthquake activity is common on the island of Hawaii. Improvements would be designed and constructed in accordance with applicable seismic design criteria and DoD requirements.	Construction/Operations. Same as Alternative A.	Construction/Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Hazardous Materials/ Waste	Construction. Construction would be carried out in compliance with applicable regulatory requirements and SOPs, including MCB Hawaii's Spill Prevention, Control and Countermeasure Plan and Integrated Contingency Plan and Army environmental requirements.	Construction. Same as Alternative A.	Construction. No change

Table 6-4. Summary of Impacts for Pohakuloa Training Area

Resource	Alternative A	Alternative B	No Action Alternative
	Operations. Squadrons would comply with MCB Hawaii's Hazardous Waste Management Plan, the Army's environmental requirements, and other SOPs to avoid/minimize impacts during training.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airfield Safety	Operations. Training would occur at existing airfield and LZs designed to meet DoD requirements. Aviation operations could be carried out in compliance with applicable SOPs.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Bird Aircraft Strike Hazard	Operations. Bird strikes are possible at PTA but none have been documented. PTA has a BASH prevention program at Bradshaw Field and contracts USDA Wildlife Service for BASH control.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Wildland Fires	Operations. Exhaust deflectors on the MV-22s would minimize fire risk; they are deployed during landings and take-offs and while on the ground with engines running at undeveloped sites. The squadrons would be subject to existing wildland fire management and response protocols for training and ranges contained in MCB Hawaii's Base Order 3000.1B, as well as to applicable Army range requirements.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Ordnance Safety	Operations. Ordnance for training is temporarily stored at PTA. The squadrons would operate in accordance with PTA ordnance safety requirements.	Operations. Same as Alternative A.	Operations. No change

Table 6-4. Summary of Impacts for Pohakuloa Training Area

Resource	Alternative A	Alternative B	No Action Alternative
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Socioeconomics			
Environmental Justice	Operations. No disproportionate impacts are expected on minority or low-income populations.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Protection of Children	Operations. No health/safety risks have been identified that would adversely affect children.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Energy Use	Construction. Minor increase in energy use	Construction. Same as Alternative A.	Construction. No change
	Operations. Increased use of fuel for aircraft, to include biofuels.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-5. Summary of Impacts for Pacific Missile Range Facility

Resource	Alternative A	Alternative B	No Action Alternative
Land Use			
Land Use Compatibility	Operations. The south end of the PMRF runway is more than 4.5 miles from the town of Kekaha. Adjacent lands are in agricultural and park use. The north end of the runway is more than two miles from the Polihale State Park boundary. Aircraft noise is not expected to affect sensitive receptors.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-5. Summary of Impacts for Pacific Missile Range Facility

Resource	Alternative A	Alternative B	No Action Alternative
Aesthetics/ Visual Resources	Operations. Training areas are not visible from the public highway or Polihale State Park. Aircraft in flight would be visible, but this is consistent with existing conditions.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation:*
Quality of Built Environment	Operations. Not applicable	Operations. Not applicable	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Land Ownership	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Public Access	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airspace	Operations. Total annual air operations at PMRF would increase by 74% compared to 2009, with Marine Corps operations representing about 16% of the total. This would be about 19% more operations than No Action.	Operations. Same as Alternative A.	Operations. Total air operations are projected to increase by approximately 46% compared to 2009.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Noise	Operations. Aircraft noise is not expected to adversely affect sensitive receptors. Adjacent lands are in agricultural and park use; the closest residential area is more than 4.5 miles away and the park is more than 2 miles away.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Air Quality	Operations. Increases in mobile source emissions (aircraft) would occur. Mobile source emissions would be readily dispersed and unlikely to impact National or State AAQS.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-5. Summary of Impacts for Pacific Missile Range Facility

Resource	Alternative A	Alternative B	No Action Alternative
Geology, Soils, Topography	Operations. No change. Aircraft would land on airfield pavement.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Drainage, Hydrology, Water Quality	Operations. No improvements are proposed at this existing airfield. With no added impervious surfaces, there would be no changes to drainage, hydrology or water quality.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Biological Resources	Operations. ESA-listed terrestrial and marine species and MBTA-listed species are found at PMRF. No ESA-listed plant species are recorded on the installation; unoccupied critical habitat for *Panicum niihauense* occurs within PMRF. No jurisdictional wetlands are found on the base, and nearshore waters are characterized by very low coral cover. With existing natural resource management measures, proposed aviation activities would have no effect on these resources. BASH, invasive species, and wildland fire risks would be managed through compliance with applicable base orders, plans/policies, and SOPs.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Cultural Resources			
Archaeological Resources	Operations. MV-22 rotor downwash could affect buried cultural deposits in the dune area. Impact would be avoided by restricting aircraft from flying over the dunes.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: No additional mitigation required given compliance with existing aviation SOPs to avoid/minimize impacts.	*Mitigation: None*	*Mitigation: None*

Table 6-5. Summary of Impacts for Pacific Missile Range Facility

Resource	Alternative A	Alternative B	No Action Alternative
Safety and Environmental Health			
Natural Hazards	Operations. The airfield is in the 100-year flood plain and the tsunami evacuation zone. Seismic threat is considered low. No construction is proposed.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Hazardous Materials/Waste	Operations. Squadrons would comply with MCB Hawaii's Hazardous Waste Management Plan, PMRF's environmental requirements, and other SOPs to avoid/minimize impacts during training.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airfield Safety	Operations. Training would occur at existing airfield designed to meet DoD requirements. Aviation operations could be carried out in compliance with applicable SOPs.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Bird Aircraft Strike Hazard	Operations. BASH risk is managed through compliance with Marine Corps aviation SOPs, the Navy's BASH Plan at PMRF, and USDA Wildlife Service's BASH control measures.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*

Table 6-5. Summary of Impacts for Pacific Missile Range Facility

Resource	Alternative A	Alternative B	No Action Alternative
Wildland Fires	Operations. Little or no impact as MV-22 aircraft would land at and take off from a paved airfield kept clear of vegetation. Exhaust deflectors on the MV-22s would minimize fire risk; they are deployed during landings and take-offs and while on the ground with engines running at undeveloped sites. The squadrons would be subject to existing wildland fire management and response protocols for training and ranges contained in MCB Hawaii's Base Order 3000.1B, as well as applicable PMRF requirements.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Ordnance Safety	Operations. Several ESQD arcs encumber the airfield taxiway and other areas of the installation. The squadrons would operate in accordance with PMRF ordnance safety requirements.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Socioeconomics			
Environmental Justice	Operations. No disproportionate impacts are expected on minority or low-income populations.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Protection of Children	Operations. No health/safety risks have been identified that would adversely affect children.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Energy Use	Operations. Increased use of fuel for aircraft, to include biofuels.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-6. Summary of Impacts for Molokai Training Support Facility

Resource	Alternative A	Alternative B	No Action Alternative
Land Use			
Land Use Compatibility	Operations. Reactivation of aviation-related activities at the site would be compatible with the adjacent Molokai Airport. Other adjacent lands are zoned agricultural. No land use compatibility issues are expected.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation:*	*Mitigation: None*
Aesthetics/ Visual Resources	Operations. Site currently overgrown with vegetation would be cleared, changing the view from the highway.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Quality of Built Environment	Construction/Operations. The site would be cleared, grubbed, graded, and paved. No vertical construction is proposed except for fencing.	Construction/Operations. Same as Alternative A.	Construction/Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Land Ownership	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Public Access	Operations. Access to the property would be restricted during training.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airspace	Operations. MTSF would be reactivated as a refueling support site for occasional use, coordinated with MWSD to meet FARP training requirements. Increase in airspace use would be minimal.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-6. Summary of Impacts for Molokai Training Support Facility

Resource	Alternative A	Alternative B	No Action Alternative
Noise	Construction. Minor construction activities would generate some noise, but it would be temporary.	Construction. Same as Alternative A.	Construction. No change
	Operations. Aircraft operations would be occurring in the vicinity of Molokai Airport, an area with no sensitive noise receptors.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Air Quality	Construction. Impacts would not be significant because emissions would be short-term, and existing controls and requirements would minimize impacts.	Construction. Same as Alternative A.	Construction. No change.
	Operations. Increases in mobile source emissions (aircraft) would occur. Mobile source emissions would be readily dispersed and unlikely to impact National or State AAQS.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Geology, Soils, Topography	Construction. Minimal, temporary impacts. BMPs would be implemented for erosion and sediment control.	Construction. Same as Alternative A.	Construction. No change
	Operations. Little or no impact due to downdraft since aircraft would land at and take off from paved areas.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Drainage, Hydrology, Water Quality	Construction. Minimal, temporary impacts. BMPs would be implemented for erosion and sediment control.	Construction. Same as Alternative A.	Construction. No change
	Operations. Little or no impact given negligible increase in impervious surfaces (approximately 3.3% of total training area).	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-6. Summary of Impacts for Molokai Training Support Facility

Resource	Alternative A	Alternative B	No Action Alternative
Biological Resources	Construction. With no natural habitat or protected species on the site, there would be no construction-related impacts.	Construction. Same as Alternative A.	Construction. No change
	Construction. With no natural habitat or protected species on the site, there would be no impacts associated with aviation activities.	Construction. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Cultural Resources			
Archaeological Resources	Construction. No archaeological sites have been identified within the APE.	Construction. Same as Alternative A.	Construction. No change
	Operations. No archaeological sites have been identified within the APE.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Safety and Environmental Health			
Natural Hazards	Construction/Operations. MTSF is in Zone X (outside the 0.2% annual chance floodplain) and outside the tsunami evacuation zone. The island of Molokai is subject to earthquake activity. Improvements would be designed and constructed in accordance with applicable seismic design criteria and DOD requirements.	Construction/Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Hazardous Materials/ Waste	Construction. Construction would be carried out in compliance with applicable regulatory requirements and SOPs, including MCB Hawaii's Spill Prevention, Control and Countermeasure Plan and Integrated Contingency Plan.	Construction. Same as Alternative A.	Construction.

Table 6-6. Summary of Impacts for Molokai Training Support Facility

Resource	Alternative A	Alternative B	No Action Alternative
	Operations. Squadrons would comply with MCB Hawaii's Hazardous Waste Management Plan and other SOPs to avoid/minimize impacts during training.	Operations. Same as Alternative A.	Operations.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airfield Safety	Operations. Training would occur at existing facility designed to meet DoD requirements. Aviation operations could be carried out in compliance with applicable SOPs.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Bird Aircraft Strike Hazard	Operations. BASH risk is managed through compliance with Marine Corps aviation SOPs.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*
Wildland Fires	Operations. Little or no impact as MV-22 aircraft would land at and take off from a paved area kept clear of vegetation. Exhaust deflectors on the MV-22s would minimize fire risk; they are deployed during landings and take-offs and while on the ground with engines running at undeveloped sites. The squadrons would be subject to existing wildland fire management and response protocols for training and ranges contained in MCB Hawaii's Base Order 3000.1B.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Ordnance Safety	Operations. Not applicable; no ordnance is stored at this training area.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*

Table 6-6. Summary of Impacts for Molokai Training Support Facility

Resource	Alternative A	Alternative B	No Action Alternative
Socioeconomics			
Environmental Justice	Operations. No disproportionate impacts are expected on minority or low-income populations.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Protection of Children	Operations. No health/safety risks have been identified that would adversely affect children.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Energy Use	Construction. Minor increase in energy use	Construction. Same as Alternative A.	Construction. No change
	Operations. Increased use of fuel for aircraft, to include biofuels.	Operations. Increased use of fuel for aircraft	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-7. Summary of Impacts for Kalaupapa Airport

Resource	Alternative A	Alternative B	No Action Alternative
Land Use			
Land Use Compatibility	Operations. The 65 dB DNL contour would be centered on the runway less than 4,000 feet in length and 800 feet in width. DNL levels would continue to be compatible with nearby land uses.	Operations. Same as Alternative A.	Operations. With a projected decrease in air operations, no areas outside of the airport boundary would experience a DNL equal to or greater than 65 dB.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Aesthetics/ Visual Resources	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Quality of Built Environment	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Land Ownership	Operations. No change	Operations. No change	Operations. No change

Table 6-7. Summary of Impacts for Kalaupapa Airport

Resource	Alternative A	Alternative B	No Action Alternative
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Public Access	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airspace	Operations. Total annual operations would be about 50% more than 2009 and 36% more than No Action. Marine Corps operations in 2009 were less than 8% of total operations. In 2018 (proposed action), Marine Corps operations would represent about 30% of total operations.	Operations. Same as Alternative A.	Operations. Marine Corps air operations would decrease by an estimated 57% with reduction to two HMH squadrons. Total airport operations would increase slightly.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Noise	Operations. The 65 dB DNL contour would be centered on the runway less than 4,000 feet in length and 800 feet in width. It would not encroach on noise sensitive receptors.	Operations. Same as Alternative A.	Operations. With a projected decrease in air operations, no areas outside of the airport boundary would experience a DNL equal to or greater than 65 dB.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Air Quality	Operations. Increases in mobile source emissions (aircraft) would occur. Mobile source emissions would be readily dispersed and unlikely to impact National or State AAQS.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Drainage, Hydrology, Water Quality	Operations. No improvements are proposed at this existing airport. With no added impervious surfaces, there would be no changes to drainage, hydrology or water quality.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-7. Summary of Impacts for Kalaupapa Airport

Resource	Alternative A	Alternative B	No Action Alternative
Biological Resources	Operations. No ESA-listed plant or species are known to occur at Kalaupapa Airport. ESA- and MBTA-listed birds have been either recorded in or are thought to transit the airport vicinity. Aviation training impacts would be minimal with implementation of existing measures to manage potential BASH risks. The presence of ESA-listed marine species has been reported, including humpback whales *(Megaptera novaeanagliae*), Hawaiian monk seals (*Monachus schauinslandi*), and green sea turtles (*Chenonia mydas*). Current operations at the airport have had no significant impacts on these species, and proposed operations would be the same.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Cultural Resources			
Historic Buildings, National Historic Landmark	Operations. The airport is within Kalaupapa National Historical Park. The National Historical Park is also a National Historic Landmark (NHL) and listed on the National Register of Historic Places. There is a potential for operational impacts on the NHL. No historic buildings are located in the airport vicinity.	Operations. Same as Alternative A.	Operations. No change

Table 6-7. Summary of Impacts for Kalaupapa Airport

Resource	Alternative A	Alternative B	No Action Alternative
Archaeological Resources	Operations. The northern edge of the runway encompasses archaeological site 1897, a complex of surface residential, agricultural, and possible burial structures, part of the Kalaupapa Field System. The portion of the site in the runway vicinity consists of small, low rock piles and other similar features. There is little potential for finding subsurface deposits. No effects on archaeological resources are expected.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: To minimize impacts on the NHL, MV-22s would not train at Kalaupapa. Aviation activities for the H-1s will be determined through continuing NHPA Section 106 consultation. Findings, including any mitigation, will be documented in the PA.	*Mitigation: Same as Alternative A.*	*Mitigation: None*
Safety and Environmental Health			
Natural Hazards	Operations. A portion of the runway is in the VE zone, indicating one-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. The airport is in the tsunami evacuation zone. Molokai is subject to earthquake activity. No construction is proposed.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Hazardous Materials/Waste	Operations. Squadrons would comply with MCB Hawaii's Hazardous Waste Management Plan, State DOT Airport environmental requirements, and other SOPs to avoid/minimize impacts during training.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-7. Summary of Impacts for Kalaupapa Airport

Resource	Alternative A	Alternative B	No Action Alternative
Airfield Safety	Operations. Training would occur at existing airfield designed to meet FAA requirements. Aviation operations could be carried out in compliance with applicable SOPs.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Bird Aircraft Strike Hazard	Operations. BASH risk is managed through compliance with Marine Corps aviation SOPs and State DOT Airports BASH control measures.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None*
Wildland Fires	Operations. Little or no impact as MV-22 aircraft would land at and take off from a paved airfield kept clear of vegetation. Exhaust deflectors on the MV-22s would minimize fire risk; they are deployed during landings and take-offs and while on the ground with engines running at undeveloped sites. The squadrons would be subject to existing wildland fire management and response protocols for training and ranges contained in MCB Hawaii's Base Order 3000.1B, as well as applicable State DOT Airports requirements.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Ordnance Safety	Operations. Not applicable; no ordnance is stored at the airport.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None.	*Mitigation: None.*	*Mitigation: None.*
Socioeconomics			
Environmental Justice	Operations. No disproportionate impacts are expected on minority or low-income populations.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-7. Summary of Impacts for Kalaupapa Airport

Resource	Alternative A	Alternative B	No Action Alternative
Protection of Children	Operations. No health/safety risks have been identified that would adversely affect children.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Energy Use	Operations. Increased use of fuel for aircraft, to include biofuels.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*

Table 6-8. Summary of Impacts for Hawaii Army National Guard Facility

Resource	Alternative A	Alternative B	No Action Alternative
Land Use			
Land Use Compatibility	Operations. The HIARNG facility is surrounded by agricultural land and a raceway park located nearby. Marine Corps aviation activities would not trigger any land use compatibility issues.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Aesthetics/ Visual Resources	Operations. The HIARNG facility is visible from the public highway. With increased aviation operations, aircraft landing at and taking off from the site would be visible. Views would be similar to existing conditions.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Quality of Built Environment	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Land Ownership	Operations. No change	Operations. No change	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Public Access	Operations. No change	Operations. No change	Operations. No change

Table 6-8. Summary of Impacts for Hawaii Army National Guard Facility

Resource	Alternative A	Alternative B	No Action Alternative
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Airspace	Operations. No tactical training proposed at HIARNG.	Operations**.** Same as Alternative A.	Operations. No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Noise	Operations**.** The HIARNG facility is surrounded by agricultural land and a raceway park located nearby. With no noise sensitive receptors in the vicinity, Marine Corps aviation activities would have minimal impact.	Operations. Same as Alternative A.	Operations. No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Air Quality	Operations. Increases in mobile source emissions (aircraft) would occur. Mobile source emissions would be readily dispersed and unlikely to impact National or State AAQS.	Operations**.** Same as Alternative A.	Operations. No change.
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Geology, Soils, Topography	Operations**.** No change. Aircraft would land on paved helipad.	Operations. Same as Alternative A.	Operations. No change.
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Drainage, Hydrology, Water Quality	Operations**.** No improvements are proposed at this existing facility. With no added impervious surfaces, there would be no changes to drainage, hydrology or water quality.	Operations**.** Same as Alternative A.	Operations. No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Biological Resources	Operations. No protected plant or animal species are known to occur on this developed site. No natural resource impacts would be associated with the proposed aviation training.	Operations. Same as Alternative A.	Operations**.** No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None*

Table 6-8. Summary of Impacts for Hawaii Army National Guard Facility

Resource	Alternative A	Alternative B	No Action Alternative
Cultural Resources			
Historic Buildings	Operations. Remains of the former Naval Air Station Puunene, such as runways and taxiways, are found on the property but not within the APE. The site is eligible for listing in the NRHP.	Operations. Same as Alternative A.	Operations. No change
Archaeological Resources	Operations. LZ Armory is located adjacent to concrete structures, remains of a portion of NAS Puunene. MV-22 rotor downwash would not affect this NRHP-eligible site.	Operations. Same as Alternative A.	Operations. No change
	Mitigation: None	*Mitigation: None*	*Mitigation: None*
Safety and Environmental Health			
Natural Hazards	Operations. The facility is in Zone X (outside the 0.2% annual chance floodplain) and not in the tsunami evacuation zone. The island of Maui is subject to earthquake activity. No construction is proposed.	Operations. Same as Alternative A.	Operations. No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Hazardous Materials/Waste	Operations. Squadrons would comply with MCB Hawaii's Hazardous Waste Management Plan, HIARNG environmental requirements, and other SOPs to avoid/minimize impacts during training.	Operations. Same as Alternative A.	Operations. No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Airfield Safety	Operations. Training would occur at an existing facility designed to meet DoD requirements. Aviation operations could be carried out in compliance with applicable SOPs.	Operations. Same as Alternative A.	Operations. No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Bird Aircraft Strike Hazard	Operations. BASH risk is managed through compliance with Marine Corps aviation SOPs.	Operations. Same as Alternative A.	Operations. No change

Table 6-8. Summary of Impacts for Hawaii Army National Guard Facility

Resource	Alternative A	Alternative B	No Action Alternative
	Mitigation. None.	*Mitigation. None.*	*Mitigation. None*
Wildland Fires	Operations. Little or no impact as MV-22 aircraft would land at and take off from a paved helipad kept clear of vegetation. Exhaust deflectors on the MV-22s would minimize fire risk; they are deployed during landings and take-offs and while on the ground with engines running at undeveloped sites. The squadrons would be subject to existing wildland fire management and response protocols for training and ranges contained in MCB Hawaii's Base Order 3000.1B, as well as applicable HIARNG requirements.	Operations. Same as Alternative A.	Operations. No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None*
Ordnance Safety	Operations. This facility includes an armory. Operations would be conducted in accordance with HIARNG ordnance safety requirements.	Operations. Same as Alternative A.	Operations. No change
	Mitigation. None.	*Mitigation. None.*	*Mitigation. None.*
Socioeconomics			
Environmental Justice	Operations. No disproportionate impacts are expected on minority or low-income populations.	Operations. Same as Alternative A.	Operations. No change
	Mitigation. None	*Mitigation. None*	*Mitigation. None.*
Protection of Children	Operations. No health/safety risks have been identified that would adversely affect children.	Operations. Same as Alternative A.	Operations. No change
	Mitigation. None.	*Mitigation. None.*	*Mitigation. None.*
Energy Use	Operations. Increased use of fuel for aircraft, to include biofuels.	Operations. Same as Alternative A.	Operations. Increased use of fuel for aircraft
	Mitigation. None.	*Mitigation. None.*	*Mitigation. None.*

CHAPTER 7

Other Considerations

Other Considerations

7.1 POSSIBLE CONFLICTS BETWEEN THE PROPOSED ACTION AND THE OBJECTIVES OF LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AREA CONCERNED

The proposed action has been assessed to determine consistency and compliance with applicable land use plans, policies, and controls for the areas in which development and training activities would occur. No conflicts have been identified. This issue is addressed in Section 1.7, Applicable Government Permits, Consultations, Laws, and Executive Orders, and in the Land Use sections in Chapters 3 and 4. It is noted that the federal government is not typically subject to state or county land use plans or statutes unless specifically required by Congress. When possible, federal agencies consider local laws and regulations to avoid conflicts.

7.2 SIGNIFICANT UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Significant unavoidable adverse effects are those which cannot be avoided by designing constraints into the alternatives, and for which no mitigation (or even partial mitigation) is feasible. Chapter 6 summarizes potential environmental impacts disclosed for each resource area at each installation/training area under each alternative. No impacts are identified which cannot be mitigated.

7.3 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE ENHANCEMENT OF LONG-TERM PRODUCTIVITY

This section compares short-term uses of the environment and its resources—for example, temporary construction-related activities—with long-term productivity or use of the same environment and resources without the proposed action. The proposed action consists of the following components: development of facilities at Marine Corps Base (MCB) Hawaii Kaneohe Bay to support the new squadrons, and aviation training activities at locations statewide, including construction of relatively minor improvements to existing facilities (mainly landing zones) at selected training areas.

Short-term uses of the environment would be mainly due to temporary construction-related impacts. Project construction would cause temporary increases in noise, air emissions, and traffic congestion in the immediate vicinity, but all would be managed by compliance with applicable regulatory requirements.

The proposed projects at MCB Hawaii Kaneohe Bay would be located mainly in already developed areas. The primary exception is the new MV-22 facilities under both Alternatives A and B. In planning for the improvements, the Marine Corps' objective was to maximize reuse of existing facilities. Another objective was to preserve as much open space as possible, since open space on the base is used for training. By siting projects in developed areas, reusing facilities, and maintaining open space, the proposed action enhances long-term productivity of the environment at MCB Hawaii Kaneohe Bay.

Air operations by the VMM and HMLA squadrons would primarily be conducted at areas where existing Marine Corps HMH squadrons currently train. The exceptions are the Molokai Training Support Facility (MTSF), which would be reactivated after being closed for many years; and the Hawaii Army National Guard (HIARNG) Facility on Maui, which offers new opportunities. The long-term productive value of the areas being considered is that, with some exceptions, they are environments generally free of natural, cultural, and other resource constraints. Where constraints exist, they can be reasonably managed to avoid or minimize significant impacts.

7.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

An irreversible impact is one that results from permanent use of a non-renewable resource. Construction of facilities at MCB Hawaii Kaneohe Bay and the training areas would involve use of non-renewable fossil fuels during both construction and operations. Initiatives to reduce energy consumption and incorporate energy-saving design features into new and renovated facilities would help offset such impacts during operations. The aviation training component of the proposed action would result in an increase in the use of fuel for the aircraft.

An irretrievable impact involves the loss of a resource that cannot be restored, such as expenditure of capital, labor, and construction materials, or disturbance or loss of an archaeological site. No significant natural resources would be lost as a result of either construction or aviation operations. Several of the proposed projects at MCB Hawaii Kaneohe Bay would involve the demolition of buildings eligible for listing in the National Register of Historic Places (NRHP), thus resulting in the loss of historic properties, i.e., irretrievable impacts. Under Alternative A, seven historic buildings would be demolished; under Alternative B, 15 historic buildings would be demolished. There is a potential for impacts on archaeological resources during ground disturbance associated with construction at MCB Hawaii Kaneohe Bay and Marine Corps Training Area Bellows (MCTAB), and possible effects on archaeological resources due to aircraft downwash at Army training areas on Oahu where archaeological surveys have not been complete. The impacts to archaeological resources, however, would be minimized and mitigated as stipulated in the PA being developed, in consultation with various consulting parties as part of the NHPA Section 106 review process.

CHAPTER 8

List of Preparers

List of Preparers

Name	Title	Education and Years of Experience	Project Participation
Project Management			
Lesley A. Matsumoto	Vice President/ Director of Environmental Consulting	B.S., Atmospheric Science/minor emphasis, Environmental Toxicology (22 years)	Principal-in-Charge, Air Quality, QA
Susan A. Sakai	Vice President/Director of Planning	M.A., Political Science B.A., Political Science (24 years)	Project Manager
Technical Team			
Richard S. Abe	Chief Engineer / Civil Engineer	B.S., Civil Engineering with Major in Hydraulics (42 years)	Drainage, Hydrology, and Water Quality; Utilities; Energy Use
Karon Y. Aoki	Graphic Designer	B.F.A., Graphic Design (28 years)	Graphic Design
Jerilyn M. Hanohano	Planner	B.A., Architecture (7 years)	Proposed Actions and Alternatives and GIS
John T. Kirkpatrick	Senior Socio-Economic Analyst	Ph.D., Anthropology M.A., Anthropology B.A., Religion Anthropology (24 years)	Socio-Economics
Michael G. Lim	Planner	B.S., Music Education (8 years)	Airspace, Word Processing
Lindsay L.M. Nakashima	Civil Engineer	B.S., Civil Engineering M.B.A. (9 years)	Traffic; Drainage, Hydrology, and Water Quality
Eric H. Tamashiro	Civil Engineer	B.S., Civil Engineering (9 years) Geotechnical Engineer (8 years)	Geology, Soils, and Topography; Natural Hazards and Hazardous Materials and Waste; Infrastructure (Solid Waste)
Mason Architects			
Angela Thompson	Historic Architect	Master of Architecture (14 years)	Historic Architect/ Architectural Historian

Name	Title	Education and Years of Experience	Project Participation
Julian Ng Incorporated			
Julian Ng, PE, PTOE	President	B.S. Civil Engineering (39 years)	Traffic Engineer
SWCA			
Jason Balmut	CADD/GIS Specialist	B.S. Geography (15 years)	Cartographer
Travis Belt	Environmental Specialist	B.S. Forestry & Natural Resources (10 years)	Botanist
John Ford	Principal	M.S. Zoology B.S. Zoology (35 years)	Project Manager
Maya LeGrande	Owner/ President, LeGrande Biological Surveys	M.S. Botany B.S. Botany (10 years)	Botanist
Adam Miyamoto	Environmental Specialist	M.S. Candidate in Oceanography B.S. Engineering (2 Years)	Ultrasonic Bat Detection Specialist
Ling Ong	Senior Scientist	Ph.D. Zoology M.S. Environmental Studies B.S. Biology (5 years)	Bat Biologist
John Polhemus	Wildlife Biologist/ Owner of JT Productions	B.S. Biology (10 years)	Wildlife Biologist
International Archaeological Research Institute, Inc.			
Matthew Bell	Archaeologist & GPS/GIS Specialist	B. A. Anthropology (6 years)	GIS Specialist
Nicole Jordan	Archaeologist & GIS Specialist	M.A., Applied Anthropology B.A., Anthropology (7 years)	GIS Specialist
Myra Jean Tuggle	Senior Archaeologist	M.A., Pacific Islands Studies B.A., Anthropology (40 years)	Project Director, Cultural Resources

Name	Title	Education and Years of Experience	Project Participation
Wyle Laboratories			
Joseph J. Czech P.E.	Principal Engineer	B.S. Aerospace Engineering (22 years)	Noise Analysis
Patrick H. Kester	Acoustical Engineer	B.S. Mechanical Engineering (4 years)	Noise Analysis

CHAPTER 9

References

References

Addison, David. 2001. *Archaeological Subsurface Testing for the Removal of Pipeline Utilities Under the Installation Restoration Program at Bellows Air Force Station, Waimānalo, Ko'olaupoko District, O'ahu, Hawai'i.* Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. International Archaeological Research Institute, Inc., Honolulu.Advisory Council on Historic Preservation (ACHP). 2001. *Caring for the Past, Managing for the Future: Federal Stewardship and America's Historic Legacy*. Advisory Council on Historic Preservation. http:// www.achp.gov /stewsum.html.

AECOM Technical Services, Inc. and Wil Chee. April 2011. Work Plan Remedial Investigation for Former Fuel Farm Sludge Disposal Area.

Alameida, Roy K. 2003. Mo'olelo o Kawaihāpai. *Hawaiian Journal of History* 37:33-46.

Allen, Gwenfread. 1950. *Hawaii's War Years. 1941-1945*. University of Hawaii Press, Honolulu.

Allen, Jane. 2000. Paleoenvironmental Analysis: Soils, Sediment, and Landforms, Site 50-80-11-4933 and Surrounding Area, Marine Corps Base Hawaii Kaneohe Bay, Mōkapu Peninsula. Appendix A1, in R. Rechtman and T. Wolforth *Site 50-80-11-4933:Limited Data Recovery at a Prehistoric Site on Mōkapu Peninsula.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Allen, Jane. 2010. [draft] *Archaeological Monitoring and Screening, Mololani and Ulupa'u Housing Areas, Hawaii Public-Private Venture (PPV) Phase IV, Marine Corps Base Hawaii (MCB Hawaii) Kaneohe Bay, O'ahu, Hawai'i. Annual Report for 2010.* Prepared for Forest City Hawaii CM, LLC. International Archaeological Research Institute, Inc., Honolulu.

Allen, Jane, and Allan J. Schilz. 1996. *Archaeological Subsurface Testing in Conjunction with Project KB-850MS, Retrofit Test Cell Building 1178 (RETROFIT) at Marine Corps Base Hawaii (MCBH) Kaneohe Bay, Mōkapu Peninsula, O'ahu, Hawai'i.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Allen, Jane, and Allan J. Schilz. 1997a. *Archaeological Monitoring and Emergency Data Recovery, Repair Water Lines and Install Water Pumping Station for Weapons Range (REWAT), Marine Corps Base Hawaii Kaneohe Bay, O'ahu, Hawai'i.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Allen, Jane, and Allan J. Schilz. 1997b. *Archaeological Monitoring for Negation of Adverse Effect of Project KB216R (MROWS-216R), Modification and Replacement of Oil/Water Separators at Marine Corps Base Hawaii (MCBH) Kaneohe Bay, O'ahu, Hawai'i.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Alvarez, Patricia M. 1982. *A History of Schofield Barracks Military Reservation*. Prepared for U.S. Army Engineer Division, Hawaii.

Anderson, Lisa. 1997a. *Emergency Data Recovery in Conjunction with MILCON Project P-541 Aircraft Rinse Facility at Marine Corps Base Hawaii (MCBH), Kaneohe Bay, O'ahu, Hawai'i.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Anderson, Lisa. 1997b. [pre-final] *Assessment and Analysis of Historic Properties at U.S. Army Training Ranges and Areas, Island of Oahu, Hawaii: For Preparation of a Cultural Management Plan.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Contract No. DACA83-95D-0006, T.O. 0001. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Anderson, Lisa. 1998. *Cultural Resource Management Plan Report, O'ahu Training Ranges and Areas, Island of O'ahu, Hawaii*. Prepared for U.S. Army Corps of Engineers, Honolulu District. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Asbury-Smith, P. and M.F. Dega. 2002. *Archaeological Monitoring and Sampling During Removal of Underground Storage Tanks and Oil/Water Separators at U.S. Marine Corps Base Hawaii, Kāne'ohe Bay, O'ahu Island, Hawai'i.* Prepared for U.S. Army Corps of Engineers, Honolulu District. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

Athens, J. Stephen. 1988. *Archaeological Reconnaissance and Subsurface Testing, Proposed OMNI Antenna and Cable Trench, Bellows Air Force Station, Waimanalo, Oahu, Hawaii.* Prepared for PACAF Contracting Center, Hawai'i, 15 ABW/DEEV, Hickam Air Force Base. International Archaeological Research Institute, Inc., Honolulu.

Athens, J. Stephen. 1989. *Archaeological Reconnaissance, Airport Improvement Project, Kalaupapa, Molokai*. Prepared for Edward K. Noda and Associates. International Archaeological Research Institute, Inc., Honolulu.

Athens, J. Stephen. 2002. *Archaeological Coring and Augering, Halekou Fishpond, Nuʻupia Ponds Wildlife Management Area, U.S. Marine Corps Base Hawaii, Kaneʻohe Bay, Oʻahu Island, Hawaiʻi.* Prepared for U.S. Army Engineer District, Honolulu. International Archaeological Research Institute, Inc., Honolulu.

Ball, Stuart. 2001. Koʻolau Summit Trail History, Part 1: Pupukea-Kahuku Trail (1924- 1926). *Along the Trail. The Hawaii Trail and Mountain Club Newsletter*. April, May, and June. http://htmclub.org/newsletters/htmnl01b.html.

Ball, Stuart. 2002a. Koʻolau Summit Trail History, Part 5: Summit Trail Building—Black Junction to Kawailoa (1/34-9/34). *Along the Trail. The Hawaii Trail and Mountain Club Newsletter*. January, February, and March. http://htmclub.org/newsletters/htmnl02a.html.

Ball, Stuart. 2002b. Koʻolau Summit Trail History, Part 8: The War Years (1942-1945). *Along the Trail. The Hawaii Trail and Mountain Club Newsletter*. October, November, and December. http://htmclub.org/newsletters/htmnl02d.html.

Barrera, William, Jr. 1982. *Mokapu Peninsula (Marine Corps Air Station, Kaneohe Bay): Archaeological and Ethnohistoric Reconnaissance and Assessment.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Chiniago, Honolulu.

Barrera, William, Jr. 1984. *Archaeological Services During Installation of Five Replacement Antennas at Bellow Air Force Station, Oahu, Hawaii.* Prepared for U.S. Army Engineer District. Chiniago, Inc., Honolulu.

Barrère, Dorothy B. 1994. The King's Mahele: the Awardees and their Lands. Ms. copy in the files of the State Historic Preservation Division, Department of Land and Natural Resources, Kapolei.

Bell Helicopter Textron Inc. 2006. *UH-1Y Pocket Guide.*

Bishop, Sereno E. 1916. *Reminiscences of Old Hawaii*. Hawaiian Gazette Co., Ltd, Honolulu.

Boeing. 2009. *MV-22 Site Evaluation Report for US Army Garrison Hawaii.* Prepared for Department of the Navy, Naval Air Systems Command Headquarters. The Boeing Company, St. Louis.

Boeing. 16 February 2011a. *MV-22 Site Evaluation Report for Marine Corps Base Hawaii, Volume I. Islands of Kauai, Hawaii, Maui, Molokai, and Lanai. Landing Zone Survey.*

Boeing. 18 March 2011b. *MV-22 Site Evaluation Report for Marine Corps Base Hawaii, Volume II. Island of Oahu. Landing Zone Survey.*

Bowen, Robert N. 1961. *Hawaiian Disposal of the Dead.* Unpublished Master's thesis, University of Hawai'i, Honolulu.

Bowen, Robert N. 1974. Mokapu: Its Historical and Archaeological Past. Appendix A, in Charles Snow, *Early Hawaiians: An Initial Study of Skeletal Remains from Mokapu, Oahu*, pp. 129-148. University Press of Kentucky, Lexington.

Bowles, Gordon T. 1940. Unpublished field notes, burial excavations on Mōkapu Peninsula. Anthropology Department, Bishop Museum, Honolulu.

Brennan, Joseph. 1974. *The Parker Ranch of Hawaii*. Harper and Row, New York.

Brown, D.L., C.R. DeBaker, and J.A. Peterson. 2008. *Phase II Archaeological Survey for Significance Determination of Cultural Resources, Stryker Brigade Combat Team Go/No Go Maneuver Areas and 1,010-Acre Area Near Pu'u Ke'eke'e, Pohakuloa Training Area, Island of Hawai'i.* Prepared for U.S. Army Engineer District, Honolulu. Garcia and Associates, Honolulu.

Brown, J.B. 1872. [map] Plane Table Sheet Mokapu Peninsula. No. 2. Scale 1:12,000. Government Register Map 734. In the files of the Hawai'i State Survey Office, Honolulu.

Buffum, A., M. Desilets, S. Roberts, J. Robins, and A.K.S. Roberts. 2004. Archaeological *Surveys of Proposed Training Areas for the Stryker Brigade Combat Team (SBCT) US Army Hawaii, Schofield Barracks, Hawaii.* Prepared for U.S. Army Engineer District, Honolulu. Contract No. DACA83-01-D-0013, T.O. 0012. Garcia and Associates, Honolulu.

Cabrera Services. June 2010. *Final Pohakuloa Training Area Firing Range Baseline Human Health Risk Assessment for Residual Depleted Uranium.*

Casen, George, and Angela Stiber. n.d. Naval Air Station Kaneohe Bay Aviation District. National Register of Historic Places Nomination Form. Prepared for Marine Corps Base Hawaii. Mason Architects, Inc., Honolulu.

Carson, Mike T., and Sarah K. Yeomans. 2000. Phase III of Intensive Archaeological Inventory Survey of Prehistoric Traditional Hawaiian Sites in Schofield Barracks Military Reservation, South Range, O'ahu Island, Hawai'i. Prepared for U.S. Army Corps of

Engineers, Honolulu District. Contract No. DACA83-95-D-0004, T.O. 0023. Scientific Consultant Services, Cultural Resource Management Services, Honolulu.

Chapman, Peter. 1970. Field Notes and Site Form for Site 50-80-02-2501, Hanakaoe Platform. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Charvet-Pond, Ann, and Paul H. Rosendahl. 1992a. *Archaeological Monitoring of Construction Excavations Associated with Airfield Pavement Improvement (Phase III), Marine Corps Air Station, Kaneohe Bay.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D. (PHRI), Hilo.

Charvet-Pond, Ann, and Paul H. Rosendahl. 1992b. *Archaeological Monitoring of Construction Excavations at Hangar 105, and Buildings 373, 399, and 1565 within Archaeologically Sensitive Area Category 2, Marine Corps Air Station, Kaneohe Bay.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D. (PHRI), Hilo.

Charvet-Pond, Ann, and Paul H. Rosendahl. 1992c. *Archaeological Monitoring of Excavations Associated with the Construction of an Electronics/Communication Shop, Former Marshlands North of Nuʻupia Ponds, Marine Corps Air Station, Kaneohe Bay.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D. (PHRI), Hilo.

Charvet-Pond, Ann, and Paul H. Rosendahl. 1992d. *Archaeological Monitoring of Excavations Associated with the Construction of Operation ISIS Facilities, in the Mokapu Peninsula Fishpond Complex (50-80-11-1002) and Archaeologically Sensitive Area Category 2, Marine Corps Air Station, Kaneohe Bay.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D. (PHRI), Hilo.

Charvet-Pond, Ann, and Paul H. Rosendahl. 1992e. *Archaeological Monitoring at Mokapu Peninsula Fishpond Complex (50-80-11-1002), Marine Corps Air Station, Kaneohe Bay*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D. (PHRI), Hilo.

Charvet-Pond, Ann, and Paul H. Rosendahl. 1992f. *Archaeological Monitoring of Excavations Associated with the Construction of Combat Vehicle and Field Maintenance Shops (Part B), Former Marshlands North of Nuʻupia Ponds, Marine Corps Air Station, Kaneohe Bay.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D. (PHRI), Hilo.

Charvet-Pond, Ann, and Paul H. Rosendahl. 1992g. *Archaeological Monitoring Southwest Periphery of Nuupia Pond and Lawrence Road, Third Street, and Selden Street, Marine Corps Air Station, Kaneohe Bay.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D., Inc. (PHRI), Hilo.

City and County of Honolulu (City). February 2008. *Draft Integrated Solid Waste Management Plan.*

City and County of Honolulu (City). *Executive Program and Budget for FY 2011.* http://www1.honolulu.gov/budget/execbgt/volume1operatingprogramandbudgetfy2011.pdf. Accessed January 2011.

City and County of Honolulu (City), Department of Environmental Services, in cooperation with The General Contractors Association of Hawaii. May 1999. *Best management practices manual for construction sites in Honolulu.*

City and County of Honolulu (City). Department of General Planning (DGP). 1992, Amended October 3, 2002. General Plan: Objectives and Policies. http://honoluludpp.org/planning/OahuGenPlan.asp.

City and County of Honolulu, Department of Planning and Permitting (DPP). August 2000. *Koolaupoko Sustainable Communities Plan.*

________. October 2002. *General Plan.* http://honoluludpp.org/planning/OahuGenPlan.asp.

Clark, Stephan, Dennis Gosser, Paul Cleghorn, and Lisa Anderson. 2004. *Erosion Mitigation for Archaeologically Sensitive Recreation Areas at the U.S. Marine Corps Base Hawaii, Kaneohe Bay, Kaneohe, Island of O'ahu, Hawai'i. Volumes 1 and 2.* With contributions by Richard Nees, James McIntosh, and Jeff Putzi. Prepared for U.S. Army Corps of Engineers. Pacific Consulting Services, Inc., Honolulu.

Cleghorn, Paul L., Joseph Farrugia, Francis Eblé, and Tim Denham. 1994. *Archaeological Survey and Testing, and Oral History Investigations Conducted at Pu'u Hawai'i Loa, Marine Corps Base Hawaii, Kaneohe, Hawai'i.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. BioSystems Analysis, Inc., Kailua.

Cleghorn, June Noelani Johnson. 1987. *Hawaiian Burial Reconsidered: An Archaeological Analysis*. Master's thesis, Anthropology Department, University of Hawai'i-Mānoa, Honolulu.

Cochrane, Ethan E. 2000. *Archaeological Monitoring of the Kalaupapa Airport Perimeter Fence, Kalaupapa and Makanalua Ahupuaʻa, Kalawao District, Molokaʻi.* Prepared for Walter Y. Arakaki, General Contractor, Inc. International Archaeological Research Institute, Inc., Honolulu

Cochrane, Ethan E. 2011a. *Archaeological Testing in Support of the Proposed MOUT Facility, Marine Corp Training Area Bellows, Waimānalo, Oʻahu, Hawaiʻi*. Prepared for Department of the Navy, Naval Facilities Engineering Command, Pacific. International Archaeological Research Institute, Inc., Honolulu.

Cochrane, Ethan E. 2011b. *Archaeological Survey and Testing at Marine Corps Base Hawaii, Kaneohe Bay for the MV-22 and H-1 Aircraft Environmental Impact Statement.* Prepared for Belt Collins Hawaii, Ltd. International Archaeological Research Institute, Inc., Honolulu.

Collins, S., T. Han, and L. Armstrong. 1994. *Inventory of Human Skeletal Remains from Mōkapu Peninsula, Koʻolaupoko District, Kāneʻohe and Heʻeia Ahupuaʻa, Oʻahu Island, Hawaiʻi.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Anthropology Department, B.P. Bishop Museum, Honolulu.

Cordy, Ross. 1984*. Archaeological Monitoring of the Dredging of Sand-Clogged Channel Between Paʻakai Pond and Kailua Bay, Marine Corps Air Station, Kaneohe Bay, Oʻahu.*

Cox, David, and Laurie Lucking. 2004. Memorandum for the record: Trip Report, Archaeological Reconnaissance Survey of Portions of the Drum Road Corridor, Kawailoa Training Area and Kahuku Training Area, for Planned Improvements to Drum Road. Environmental Division, Directorate of Public Works, U.S. Army Garrison, Hawaii. Appendix A, in B. Whitehead, P. Cleghorn, and J. McIntosh, *Archaeological Inventory Survey for Improvements to the Drum Road Helemano Military Reservation to Kahuku Training Area, Oahu, Hawaii*. Prepared for Wil Chee Planning, Inc. Contract No. DACA83-00-D-0012, T.O. 0026. Pacific Legacy, Inc., Kailua.

Davis, Bertell. 1981. *Archaeological Reconnaissance Survey of Hawaiian Wind Farm Project at Kahuku, Oʻahu, Hawaiʻi*. Prepared for Bechtel Power Corporation. Department of Anthropology, B.P. Bishop Museu, Honolulu.

Davis, Bertell, Tom Dye, and Wendell Kam. 1976. *Archaeological Investigations at the Kailua Effluent Force Main, Site 50-OA-G5-67, Kaneohe, Oahu, Hawaii.* Prepared for City and County of Honolulu, Department of Public Works, Division of Sewers. Anthropology Department, Bishop Museum, Honolulu.

DeBaker, Cassidy R., and Michael Desilets. 2007. *Archaeological and Cultural Monitoring of Soil Testing and Construction Related Activities for Stryker Brigade Combat Team Transformation Projects, O'ahu and Hawai'i Islands, Hawai'i.* Prepared for U.S. Army Engineer District, Honolulu. Garcia and Associates, Honolulu.

Dega, Michael. 1997. *Archaeological Monitoring and Sampling of Underground Storage Tank Removal at Moloka'i Training Support Facility, Pala'au, Moloka'i, Maui County, Hawai'i.* Prepared for U.S. Army Engineer District. Scientific Consultant Services, Cultural Resource Management Services, Honolulu.

Dega, Michael. 1998. *Archaeological Monitoring and Sampling During Removal of Underground Storage Tanks and Oil/Water Separators at U.S. Marine Corps Base Hawaii, Kaneohe Bay, O'ahu Island, Hawai'i.* Prepared for U.S. Army Engineer District. Scientific Consultant Services, Cultural Resource Management Services, Honolulu.

Dega, Michael, and Leeann McGerty. 2002a*. Cultural Resources Inventory Survey and Limited Testing of the Kawailoa Training Area for the Preparation of a Cultural Resource Management Plan for U.S. Army Training Ranges and Areas, O'ahu Island, Hawai'i*. Prepared for U.S. Army Corps of Engineers, Honolulu District. Contract No. DACA83-95-D-000, T.O. 0014. Scientific Consultant Services, Cultural Resource Management Services, Honolulu.

Dega, Michael, and Leeann McGerty. 2002b. *A Cultural Resources Inventory Survey, Phase II, of the US Army Kawailoa Training Area (KLOA), for the US Garrison, Hawaii, Ecosystem Management Program, Oahu Island.* Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. Contract No. DACA83-95-D-000, T.O. 0022. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

Dega, M., R. Ogg, and R.L. Spear. 1997. [draft summary] *Archaeological Subsurface Testing, Monitoring, and Sampling of Cultural Resources during Removal of Mangrove Vegetation at Marine Corps Base Hawaii, Kane'ohe Bay, Ko'olaupoko District, O'ahu Island, Hawai'i.* Prepared for U.S. Army Engineer District. Scientific Consultant Services, Cultural Resource Management Services, Honolulu.

Denham, T., J. Farrugia, and P. Cleghorn. 1995. [draft] *Archaeological Preconstruction Testing and Monitoring at Work Areas 1 and 2 of the Pollution Abatement Facilities Project, Marine Corps Base Hawaii, Kaneohe Bay (MCBH-KBay), Ko'olaupoko District, O'ahu Island, Hawai'i.* Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. BioSystems Analysis, Inc., Kailua.

Department of the Army, Headquarters (HQ). October 16, 2008a. *Airspace, Airfields/Heliports, Flight Activities, Air Traffic Control, and Navigational Aids.*

________. February 2008b. *Final Environmental Impact Statement for Permanent Stationing of the 2/25th Stryker Brigade Combat Team*. Volume I.

Department of Army, Office of the Secretary of the Army. May 2004. Final Environmental Impact Statement: Transformation of the 2nd Brigade, 25th Infantry Division (L) to a Stryker Brigade Combat Team in Hawai‘i. Volume 1.

Department of the Army, U.S. Army Hawaii, 25th ID(L). n.d. *Integrated Natural Resources Management Plan 2002–2006 and Environmental Assessment Pohakuloa Training Area.*

________. 2006. *Integrated Wildland Fire Management Plan.*

Department of the Army, U.S. Army Garrison Hawaii (USAG-HI). 2008a. Implementation Plan for Oahu Training Areas: Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, and Kahuku Training Area.

________. October 2008b. P*ohakuloa Training Area (PTA) External Standard Operating Procedures.*

________. 2010a. *Final Pohakuloa Training Area Installation Action Plan.*

________. July 2010b. *Integrated Natural Resources Management Plan 2010–2014. Island of Oahu, Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, Kahuku Training Area, Dillingham Military Reservation, Mākua Military Reservation, and Tripler Army Medical Center.*

________. July 2010. *Integrated Natural Resources Management Plan 2010–2014 Island of Hawaii Pohakuloa.*

Department of the Navy (Navy). October 1999. Final Environmental Impact Introduction of the V-22 to the Second Marine Aircraft Wing.

________. May 2008a. *Hawaii Range Complex Final Environmental impact Statement/ Overseas Environmental Impact Statement.*

________. November 2008b. *Final Environmental Impact Statement for the Introduction of the P-8A Multi-Mission Maritime Aircraft into the U.S. Navy Fleet.*

________. January 2010. *Naval Aviation Vision.*

Department of the Navy, Naval Energy and Environmental Support Activity and Ordnance Environment Support Office (NEESA/OESO). April 1984. Navy Assessment and Control of Installation Pollutants Initial Assessment Study of Marine Corps Air Station Kaneohe Bay, Hawaii, UIC:M00318.Department of the Navy, Commander, Navy Region Hawaii (CNRH). December 2004. *Mana Plain Drainage Cost Study, PMRF.*

Department of the Navy, Commander, Navy Region Hawaii (CNRH). November 2010. *Integrated Natural Resources Management Plan, Pacific Missile Range Facility.*

Department of the Navy, Commander Pacific Missile Range Facility (PMRF). April 2010. *Pacific Missile Range Facility Intercept Test Support Environmental Assessment/ Overseas Environmental Assessment.*

Department of the Navy, Naval Facilities Engineering Command (NAVFAC). December 13, 2007. Capital Improvements Engineering and Construction Bulletin. Issue No. 2008-01.

Department of the Navy, Naval Facilities Engineering Command Hawaii (NAVFAC HI) Public Works. March 2011.

Department of the Navy, Naval Facilities Engineering Command Hawaii Facilities Planning and Real Estate Department. December 15, 2006. *Marine Corps Base Hawaii Master Plan, Volume 1, Land Use Plan*. Final.

Department of the Navy, Naval Facilities Engineering Command, Pacific Division (NAVFAC PAC). January 2002. *Marine Corps Training Area Bellows Master Plan.*

Department of the Navy, Naval Facilities Engineering Command, Pacific Division (NAVFAC PAC). July 2006. *Air Installation Compatible Use Zones (AICUZ) Study Update. Marine Corps Base Hawaii, Kaneohe Bay*.

________. October 2008. *Air Installation Compatible Use Zones (AICUZ) Study Update. Marine Corps Base Hawaii, Kaneohe Bay*.

Department of the Navy, Navy Safety Center (NSC). February 2010. Aircraft mishap data.

Department of the Navy, Naval Facilities Engineering Service Center (NFESC). December 2002. *Marine Corps Base Hawaii Coral Reef Ecosystem Management Study.* N47408-00P6207 p00005, Task 1.

________. December 2002. *Marine Corps Base Hawaii Invasive Species Management Study.* N47408-00-P-6207 p00005, Task 3.

________. December 2004. *Marine Corps Base Hawaii Hazardous Waste Management Plan.* Site Specific Report SSR-2973-EVN.

Department of the Navy, Office of the Chief of Naval Operations (CNO). January 2010. Change 2 October 2010. *Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual.* OPNAVINST 51021D and MCO P5102.1B.

Desilets, Michael. 2007. *Archaeological and Cultural Monitoring Report for Unexploded Ordnance Surface and Subsurface Clearance Activities at Battle Area Complex, Pohakuloa Training Area, Ka'ohe Ahupua'a, Hamakua District, Island of Hawai'i, Hawai'i.* Prepared for U.S. Army Engineer District, Honolulu. Garcia and Associates, Honolulu.

Desilets, Michael, and Thomas S. Dye. 2002. *Archaeological Monitoring and Sampling During Bellows OU7 UST Removal Project Interim Remedial Action, Phase I, Bellows Air Force Station, Waimānalo, Ko'olaupoko, O'ahu.* Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. International Archaeological Research Institute, Inc., Honolulu.

Desilets, M., A.K.S. Roberts, A. Buffum, and S.J. Roberts. 2005. *Phase I Archaeology Reconnaissance Survey for Stryker Brigade Combat Team Go/No Go Maneuver Areas at U.S. Army Pohakuloa Training Area, Ka'ohe Ahupua'a, Hamakua District and Pu'uanahulu Ahupua'a, North Kona District, Island of Hawai'i, Hawai'i.* Contract No. DACA83-03-D-0011, T.O. 0001. Prepared for U.S. Army Engineer District, Honolulu. Garcia and Associates, Honolulu.

Devaney, D.M., M. Kelly, P.J. Lee, and L.S. Motteler. 1976. *Kāne'ohe: A History of Change*. Prepared for U.S. Army Corps of Engineers. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Dixon B, D. Gosser, C. O'Hare, M. Riford, and S.D. Clark. 2002. *Addendum to Archaeological Monitoring in Support of the Base Realignment and Closure (BRAC) Program Relocating Barbers Point Naval Air Station Operations to Marine Corps Base Hawaii, Kaneohe Bay, O'ahu Island, Hawai'i.* Prepared for U.S. Department of the Navy, Pacific

Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Donn, John M. 1902. [map] Oahu; Hawaiian Islands. Hawaiian Territory Survey. Map No. 264.1. In the files of the Hawai'i State Archives, Honolulu.

Drigot, Dr. Diane C., Bruce A. Wilcox, Kristin N. Duin. November 2001. *Marine Corps Base Hawaii Integrated Natural Resources Management Plan/Environmental Assessment (MCBH INRMP/EA) (2002–2006).*

Drolet, Robert P. 2000. *Archaeological Inventory Survey of Area A1, Kahuku Training Area, O'ahu Island, Hawai'i*. Prepared for U.S. Army Corps of Engineers. Contract No. DACA83-95-D-0006, T.O. 0016. Ogden Environmental and Energy Services Co., Inc. Honolulu, Hawaii.

Drolet, Robert, and Aki Sinoto. 1998. *An Archaeological Inventory Survey of the Proposed Army National Guard Planning Area, Pulehunui Ahupua'a, Wailuku, Maui.* Prepared for GYA Architects, Inc. Aki Sinoto Consulting, Honolulu.

Drolet, R.P., P.A. Drolet, and A.J. Schilz. 1996. *Archaeological Inventory Survey of Pali Kilo and Ulupa'u Crater Parcels, Marine Corps Base Hawaii Kaneohe Bay, O'ahu, Hawai'i.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Drolet, Robert, Ann K. Yoklavich, and James Landrum. 1996. *Cultural Resources Management Overview Survey Pacific Missile Range Facility,Hawaiian Area Kaua'i, Hawai'i in Conjunction with Department of Defense Legacy Resource Management Program Project No. 70.* Prepared for Department of the Navy, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Dye, Tom. 1976. The Kailua Effluent Force Main Project: Test Excavations in Areas D and E, Controlled Excavations in Areas D and E. Report 2, in B. Davis. T. Dye, and W. Kam, *Archaeological Investigations at the Kailua Effluent Force Main, Site 50-OA-G5-67, Kaneohe, Oahu, Hawaii*. Prepared for City and County of Honolulu, Department of Public Works, Division of Sewers. Anthropology Department, B.P. Bishop Museum, Honolulu.

_______. 1998. *Archaeological Services in Support of the Final Environmental Impact Statement for Proposed Expansion of Military Training and the Construction of Improvements to Existing Recreational Resources at Bellows Air Force Station, Waimānalo, Hawai'i.*

Task 2: Archaeological Investigation for Specified Areas. Prepared for Department of the Navy, Pacific Division, Naval Facilities Engineering Command. International Archaeological Research Institute, Inc., Honolulu.

Dye, Thomas S. and Jeffrey Pantaleo. 2010. Age of the 018 Site, Hawai'i. *Archaeology of Oceania* (45):113-119

Eastwood, Robert. 2010. Letter to William J. Aila, Jr., State Historic Preservation Officer, re: Section 106 compliance for rehabilitation of Old Kahuku Range Control LZ, Kahuku Training Area. December. U.S. Army Installation Management Command, Pacific Region, U.S. Army Garrison, Hawaii, Schofield Barracks.

Edward K. Noda & Associates (EKNA) and Chapman Consulting Services/GK & Associates. March 1991. FEIS Kalaupapa Airport, Roadways and Wharf Improvements. (State Project No. AM5011-02)

Element Environmental, LLC. April 2011. *Final Work Plan, Remedial Investigation / Feasibility Study for Quarry Pit Landfill (MCB Hawaii Site 0002).*

________. February 2012. *Remedial Investigation/Feasibility Study for Quarry Pit Landfill (MCB Hawaii Site 0002).*

Emerson, J.S. n.d. [map] Untitled. Scale 500 feet=1 inch. Government Register Map No. 1881 [appears to be worksheet for GRM 1533]. In the files of the Hawai'i State Survey Office, Honolulu.

Emerson, Oliver P. 1928. *Pioneer Days in Hawaii*. Doubleday, Doran & Company, Inc., Garden City, New York.

Environment News Service (ENS). January 6, 2009. "Honolulu Must Spend Over $1 Billion on Wastewater Treatment." www.ens-newswire.com/ens/jan2009/2009-01-06-092.html.

Environmental Protection Agency (EPA). No date. "Air Permits Delegation Agreements." http://www.epa.gov/region9/air/permit/permitdelegation.html#part71. Accessed March 22, 2011.

________. March 1974. *Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety.* EPA 550/9-74-004.

________. April 15, 2011. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2009.*

Erkelens, Conrad. 2000. *Archaeological Monitoring and Data Recovery, Underground Storage Tanks Removal, Bellows Air Force Station, Waimanalo, O'ahu, Hawai'i.* Prepared for U. S. Army Engineer District, Honolulu. Contract No. DACA83-95-D-0007, T.O. 0001. International Archaeological Research Institute, Inc., Honolulu.

Escott, Glenn G. 2004. *Phase II Archaeological Investigations at State Sites 50-10-21-23499, 50-10-21-23515, 50-10-21-23516, 50-10-21-23517, and 50-10-21-23539 on Lands of the Ke'āmuku Sheep and Cattle Station Located in the Ahupua'a of Waikōloa, South Kohala District, Island of Hawai'i.* Scientific Consultant Services/ Cultural Resource Management Services, Honolulu.

Escott, Glenn G., and Suzan Keris. 2009. *An Archaeological Inventory Survey Report for 600 Acres Located on Lands of Ke'āmuku, Waikōloa Ahupua'a, South Kohala District, Hawai'i Island, Hawai'i.* Prepared for DMT Consultant Engineers. Scientific Consultant Services, Honolulu.

Executive Order 2565, Order of Withdrawal, dated 28 March 1917.

Federal Aviation Administration (FAA). 2010. *Aerospace Forecast Fiscal Years 2010–2030.*

Federal Aviation Administration (FAA). March 2011. *Procedures for Handling Airspace Matters.* Order JO 7400.2H.

Federal Register (FR). March 18, 2003. "Final Designations and Nondesignations of Critical Habitat for 42 Plant Species from the Island of Molokai, HI." Final Rule. Department of the Interior, Fish and Wildlife Service, 50 CFR part 17, Endangered and Threatened Wildlife and Plants.

________. April 5, 2010. "Revisions to the General Conformity Regulations."

________. July 15, 2010. "Notice of Intent to Prepare and Environmental Impact Statement and Overseas Environmental Impact Statement for Navy Hawaii-Southern California Training and Testing and to Announce Public Scoping Meetings." Volume 75, Number 135.

Federal Register (FR). October 18, 2010. "Establishment of Class E Airspace: Kalaupapa, HI." Paragraph 75 FR 63708.

________. October 14, 2011 'Notice of availability, PEIS for Modernization of Training Infrastructure at Pohakuloa Training Area, HI" Volume 76, No. 199.

Fiddler, Frank. 1956. *Mokapu: A Study of the Land*. MS, prepared for U.S. Marine Corps Air Station, Kaneohe Bay.

Fletcher, C.H. 2009 “Sea Level by the End of the 21st Century: A Review”. Shore and Beach, 77.4: 1-9.

Fletcher, Chip. 2010. *Hawai‘i’s Changing Climate-Briefing Sheet, 2010.* University of Hawaii Sea Grant College Program Center for Island Climate Adaptation and Policy.

Flores, Kalani and Aletha G. Kaohi. 1993. *Hawaiian Cultural and Historical Survey of Nohili*, *Mana*, *Kona District*, *Island of Kaua‘i*, *State of Hawai‘i*. Prepared for Advanced Sciences. Hawai‘i Pono‘i, ‘Ele‘ele, Kaua‘i.

Fornander, Abraham. 1969. *An Account of the Polynesian Race: Its Origin and Migrations*. Charles E. Tuttle, Rutland, Vermont. [originally published in 1880 by Trubner & Co., London]GCR Consulting. AirportIQ 5010 Airport Master Records and Reports. www.gcr1.com/5010web/.

Goodwin, Conrad Mac. 1994. *A Kalaupapa Sweet Potato Farm: Report on Archaeological Data Recovery Operations, Kalaupapa Airport Improvement Project, Kalaupapa, Molokai,Hawai‘i.* Prepared for Edward K. Noda & Associates. International Archaeological Research Institute, Inc., Honolulu.

Gosser, D., S.D. Clark, and M. Riford. 2002. *Archaeological Monitoring in Support of Airfield Pavement Repairs Phase II Project, MCBH Kaneohe Bay, O‘ahu Island, Hawai‘i*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Greene, Linda Wedel. 1985. *Exile in Paradise, The Isolation of Hawaii’s Leprosy Victims and Development of Kalaupapa Settlement, 1865 to the Present.* National Park Service.

Hammatt, Hallett H., and David W. Shideler. 1989. *Archaeological Survey and Testing at Bellows Air Force Station for New Antennas and Trench Lines, Waimanalo, Ko‘olaupoko, O‘ahu*. Prepared for U.S. Army Corps of Engineers. Cultural Surveys Hawaii, Kailua.

Hammatt, H.H., D.K. Borthwick, and D.W. Shideler. 1985. *Archaeological Coring and Testing at Nu‘upia Ponds: Kaneohe Marine Corps Air Station, Mōkapu, O‘ahu.* Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. Cultural Surveys Hawaii, Kailua.

Hand, E.R. 1928. [map] Hawaiian Is., East Coast of Oahu, Alala Pt. to Mokapu Pt. U.S. Coast and Geodetic Survey, Register No. 4380. Scale 1:5,000. On line at www.soest.hawaii.edu/coasts/data/oahu.

Handy, E.S. Craighill. 1940. *The Hawaiian Planter*. Volume 1. Bishop Museum Bulletin 161. Bishop Museum Press, Honolulu.

Handy, E.S.C. and E.G. Handy. with M.K. Pukui. 1972. *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Hawaii Army National Guard (HIARNG). April 2001. *Final Environmental Assessment for Hawaii Army National Guard's Puunene Armory and Related Improvements.* 2001-04-23-MA-FEA.

Hawaii Clean Energy Initiative (HCEI). 2010. *Programmatic Environmental Impact Statement for the Hawaii Interisland Renewable Energy Progra*m. www.hawaiicleanenergyinitiative.org/hirep-wind/.

Head, James. 2009. Memorandum for the Record: Archaeological Survey of Proposed Landing Zones (LZ's) for the 25th Aviation Unit in the Keʻāmuku Maneuver Area (KMA), Pōhakuloa Training Area, TMK (3) 6-7-001:003, Waikoloa Ahupuaʻa, South Kohala District, Hawaiʻi Island, Hawaiʻi. March 20. Environmental Office, Pohakuloa Training Area.

Henshaw, H. 1902. *Birds of the Hawaiian Islands*. Thos. Thrum, Honolulu.

Hibbard, Don. 1996. Letter to D. Chafee, Scientific Consultant Services, dated February 23. State Historic Preservation Division, Department of Land and Natural Resources, State of Hawaiʻi.

Honolulu Star-Advertiser. February 25, 2011 and July 19, 2010.

Hurlbett, R.E. and A.E. Haun. 1987. *Task Product 4: Cultural Resources Inventory, Evaluation, and Recommendations. Subtask 4A: Inventory and Evaluation. Cultural Resources Management Plan. Bellows Air Force Station, Oahu, Hawaii.* Project HIC85-9117. Prepared for PACAF Contracting Center, Hawaiʻi, 15th Air Base Wing. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Ii, John Papa. 1963. *Fragments of Hawaiian History*. Bishop Museum Press, Honolulu. [1866-1870 Hawaiian publications; translation by M.K. Pukui, edited by D.B. Barrère].

Indices of Awards. 1929. *Indices of Awards Made by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands*. Compiled and published by the Office of the Commissioner of Public Lands of the Territory of Hawaii. Star-Bulletin Press, Honolulu.

Inouye, Robert. n.d. [map] Map of PMRF with hand-written notations regarding locations and date of recovered human bone (inadvertent finds). In the files of the Environmental Office, Pacific Missile Range Facility, Kauai.

International Archaeological Research Institute. June 2011. *Archaeological Survey and Testing at Marine Corps Base Hawaii, Kaneohe for the MV-22 Aviation Facility.*

Jimenez, J.A., T.R. Wolforth, R.B. Rechtman, and A.E. Haun. 1998. *Archaeological Monitoring of Trench Excavations for Phase II (KB356MS) Repairs to Sanitary Sewer System, Marine Corps Base Hawaii Kaneohe Bay, O'ahu*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Joint Chiefs of Staff. September 30, 2008. *Joint Shipboard Helicopter Operations.* JP 3-04.

Kaelemakule, S.L. 1867. [map] Waikoloa, Waimea, Hawaii. Government Register Map No. 574. In the files of the Hawai'i State Survey Office, Honolulu.

Kamakau, Samuel M. 1961. *Ruling Chiefs of Hawaii.* Kamehameha Schools Press, Honolulu. [translation of 1866-1871 articles in Hawaiian newspapers; republished in 1992 by Bishop Museum Press]

________. 1991. *Tales and Traditions of the People of Old, Na Moolelo a ka Poe Kahiko*. Bishop Museum Press, Honolulu. [translation of 1865-1869 articles in Hawaiian language newspapers].

Kame'eleihiwa, Lilikalā. 1992. *Native Land and Foreign Desires; Pahea Lā E Pono Ai?* Bishop Museum Press, Honolulu.

Kanahele, Pualani Kanakaole and Edward L.H. Kanahele. 1997. *A Hawaiian Cultural Impact Assessment of the Proposed Saddle Road Alignments. Project A-AD-6(1)*. Native Hawaiian Cultural Consultants, Hilo.

Kaschko, Michael. 1996. *Archaeological Monitoring for Soils Investigation Work (Soil Borings) FY 96 BRAC Project P-268T Aircraft Apron, Marine Corps Base Hawaii, Kaneohe Bay, 1-4-4-008.* [info from 2006 ICRMP]

Kikuchi, William. 1973. *Hawaiian Aquacultural Systems.* Ph.D. Dissertation, University of Arizona, Tucson.

King, Pauline N. 1989. *Journal of Stephen Reynolds. Volume I: 1823-1829*. Ku Paʻa Incorporated, Honolulu, and the Peabody Museum of Salem, Salem, Massachusetts.

Kirch, Patrick V. 1992. Anahulu: *The Anthropology of History in the Kingdom of Hawaii: Volume Two. The Archaeology of History.* University of Chicago Press, Chicago.

________. 2002. *From the 'Cliffs of Keōlewa' to the 'Sea of Papaloa': An Archaeological Reconnaissance of Portions of the Kalaupapa National Historical Park, Molokaʻi, Hawaiian Islands.* Oceanic Archaeology Laboratory Special Publication 2. Archaeological Research Facility, University of California, Berkeley.

Ladefoged, Thegn. 1990. A *Dryland Agricultural System at Kalaupapa, Molokaʻi: Archaeological Inventory Survey, Airport Improvement Project*. Prepared for Edward K. Noda and Associates. International Archaeological Research Institute, Inc., Honolulu.

Langlas, C., T. Wolforth, J. Head, and P. Jensen. 1999. *Archaeological Inventory Survey and Historic and Traditional Cultural Assessment for the Hawaiʻi Defense Access Road A-AD-6(1) and Saddle Road 11*. Prepared for RUST Environmental & Infrastructure, Inc. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Lauer, Adam. 2008. *Archaeological Monitoring in Support of Restoration of Building 605 at Marine Corps Base Hawaii Kaneohe Bay, Oʻahu, Hawaiʻi*. Prepared for U.S. Department of the Navy, Naval Facilities Engineering Command, Pacific. International Archaeological Research Institute, Inc., Honolulu.

Lawrence, T. and R.L. Spear. 2000. *Archaeological Monitoring and Sampling of Underground Storage Tanks at Marine Corps Base Hawaii, Kāneʻohe Bay, Hawaiʻi*. Prepared for U.S. Army Engineer District. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

Leidemann, Helen, and Paul Cleghorn. 1983. *Archaeological Monitoring of Vegetation Clearance of Antenna Fields at Bellows Air Force Station, Oʻahu, Hawaiʻi*. Prepared for Pacific Division, Naval Facilities Engineering Command. Department of Anthropology, B.P. Bishop Museum Honolulu.

Lyons, C.J., and L.F. Brown. n.d. [map] The Mokapu Peninsula, Koolau, Oahu. Scale 1:12,000. Government Register Map 1073. In the files of the Hawaiʻi State Survey Office, Honolulu.

MacCaughey, Vaughan. 1917. A Footpath Journey. *Mid Pacific Magazine* 14(1):181-196.

Macdonald, Gordon and Agatin Abbott, 1970. *Volcanoes in the Sea, The Geology of Hawaii.*

Major, Maurice, and Boyd Dixon. 1995. *Archaeological Survey and Evaluation, USAF Receiver Station, Hoʻolehua, Molokaʻi, Maui County, Hawaiʻi*. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Major, Maurice, and Thomas S. Dye. 2006. *Archaeological Inventory Survey and Monitoring During Communication Line Installation, Bellows Air Force Station and Marine Corps Training Area-Bellows, Waimānalo, Oʻahu, Hawaiʻi*. Prepared for J.M. Waller Associates, Inc. T.S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

Malo, David. 1951. *Hawaiian Antiquities*. Bishop Museum Press, Honolulu. [reprint of N.B. Emerson 1898 translation of 1838 *Moolelo Hawaii*]

Maly, Kepā. 1998. *Mauna Kea Kuahiwi Ku Haʻo i Ka Mālie: A Report on Archival and Historical Documentary Research, Ahupuaʻa of Humuʻula, Kaʻohe, Districts of Hilo and Hāmākua, Island of Hawaiʻi*. Prepared for Native Lands Institute. Kumu Pono Associates, Hilo.

________. *Mauna Kea Science Reserve and Hale Pōhaku Complex Development Plan Update: Oral History and Consultation Study, and Archival Literature Research*. Prepared for Group 70 International. Kumu Pono Associates, Hilo.

Maly, Kepa and Onaona Maly. 2002. He Wahi Moʻolelo No Ka Aina A Me Na Ohana O Waikii Ma Waikoloa (Kalana O Waimea,Kohala) A Me Ka Aina Mauna: A Collection of Traditions and Historical Accounts of the Lands and Families of Waikii at Waikoloa (Waimea Region, South Kohala), and the Mountain Lands, Island of Hawaii. Kumu Pono Associates. Hilo.

________. 2005. *Mauna Kea—Ka Piko Kaulana o ka ʻĀina (Mauna Kea—the Famous Summit of the Land). A Collection of Native Traditions, Historical Accounts, and Oral History Interviews for: Mauna Kea, the Lands of Kaʻohe, Humuʻula and the ʻĀina Mauna on the Island of Hawaiʻi*. Prepared for Office of Mauna Kea Management, University of Hawaiʻi-Hilo. Kumu Pono Associates, Hilo.

Margotta, Matthew T. 2009. Letter to Laura H. Thielen, State Historic Preservation Division, re: Section 106 compliance at helipads, Kahuku Training Area. August. U.S. Army Installation Management Command, Pacific Region, U.S. Army Garrison, Hawaii, Schofield Barracks.

_______. 2010. Letter to Laura H. Thielen, State Historic Preservation Division re: Section 106 compliance at LZs Lower 72, Upper 72, and Italy, Schofield Barracks East Range. February. U.S. Army Installation Management Command, Pacific Region, U.S. Army Garrison, Hawaii, Schofield Barracks.

Maui Military Museum (MMM). 1996. Draft Outline for Data Recovery Plan: Naval Air Station Puʻunene. Prepared for the State of Hawaiʻi, Department of Land and Natural Resources, State Historic Preservation Division. The Maui Military Museum, Inc., Makawao, Maui.

McAllister, J.G. 1933. *Archaeology of Oahu*. Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu.

McCoy, Mark. 2006. Landscape, Social Memory, and Society: An Ethnohistoric-Archaeological Study of Three Hawaiian Communities. Unpublished PhD Dissertation, University of California, Berkeley.

McCoy, Mark. 2007. A Revised Late Holocene Culture History for Molokaʻi Island, Hawaiʻi. *Radiocarbon* 49:1273-1322.

McDonnell, George. 2005. Memorandum for the record: Trip Report, Archaeological Reconnaissance Survey of Staging Areas and Recordation of Bridges along Drum Road. Environmental Division, Directorate of Public Works, U.S. Army Garrison, Hawaii. Appendix B, in B. Whitehead, P. Cleghorn, and J. McIntosh, *Archaeological Inventory Survey for Improvements to the Drum Road: Helemano Military Reservation to Kahuku Training Area, Oahu, Hawaii*. Prepared for Wil Chee Planning, Inc. Contract No. DACA83-00-D-0012, T.O. 0026. Pacific Legacy, Inc., Kailua.

McGerty, Leeann, and Robert Spear. 2001. Cultural Resources Inventory Survey of Dillingham Military Reservation (DMR) Ahupuaʻa of Mokuleia, Kawailoa, Kealia, and Kaena, Waialua District, Oʻahu Island, Hawaiʻi. Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. Contract No. DACA83-95-D-0004, T.O. 0013, 0017. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

_______. 2004. A Planning-Level Traditional Cultural Places (TCP) Survey of Kahuku Training Area (KTA) and Kawailoa Training Area (KLOA), U.S. Army Garrison, Hawaiʻi, Island of ʻahu, Hawai'i. Prepared for U.S. Army Garrison, Hawaiʻi. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

_______. 2009. *Phase II Archaeological Evaluation of All Sites Except Sites 5487 and 191*, *Dillingham Military Reservation*, *Island of Oʻahu*, *Hawaiʻi*. Prepared for Directorate of

Public Works, U.S. Army Garrison Hawaii. Contract No. DAMD17-01-2-0006, T.O. 0002. Scientific Consultant Services/Cultural Resource Management Services, Honolulu. [note: the document is not paginated].

McGregor, Davianna Pōmaikaʻi. 2007. *Nā Kuaʻāina. Living Hawaiian Culture*. University of Hawaiʻi Press, Honolulu.

McIntosh, James D., and Paul L. Cleghorn. 2010. *Archaeological Monitoring and Data Recovery for the PPV Phase II Kapoho Neighborhood Housing Replacement, Marine Corps Base Hawaii, Kāneʻohe Bay, Island of Oʻahu*. Prepared for Mason Architects, Inc. Pacific Legacy, Inc., Kailua.

Mink, John F. and L. Stephen Lau. February 1990a Revised. *Technical Report No. 179, Aquifer Identification and Classification for Oahu: Groundwater Protection Strategy for Hawaii.* Water Resources Research Center, University of Hawaii at Manoa.

________. February 1990b . *Technical Report No. 185 Aquifer Identification and Classification for Maui: Groundwater Protection Strategy for Hawaii.* Water Resources Research Center, University of Hawaii.

________. October 1992. *Technical Report No. 187 Aquifer Identification and Classification for Molokai: Groundwater Protection Strategy for Hawaii.* Water Resources Research Center, University of Hawaii.

________. May 1993. Water Resources Research Center, University of Hawaii. Technical Report No. 191 Aquifer Identification and Classification for the Island of Hawaii: Groundwater Protection Strategy for Hawaii.

Moblo, Penny. 1991. *Literature Review and Archaeological Reconnaissance Survey for Dillingham Airfield Master Plan Area, Oʻahu, Hawaiʻi*. Prepared for Edward K. Noda and Associates, Inc. International Archaeological Research Institute, Inc.

Moniz-Nakamura, Jadelyn, Kathleen Sherry, and Laila Tamimi. 1998. Foraging for Food? Prehistoric Pit Features at Pōhakuloa, Hawaiʻi Island. *Rapa Nui Journal* 12(4):110-117.

Monsarrat, M.D. 1899. [map] Mokapu, Koolaupoko, Oahu, showing contours and cane lands. Scale 1 inch=1,000 feet. Government Register Map 2427. In the files of the Hawaii State Survey Office, Honolulu.

Morrison, A.E., C.P. Walker, and M. Bell. 2010. *Archaeological Survey and Testing at Former Marine Aircraft Control Squadron (MACS) II Facility, Marine Corps Base Hawaii, Kaneohe Bay, O'ahu, Hawai'i.* Prepared for U.S. Department of the Navy, Naval Facilities Engineering Command, Pacific. International Archaeological Research Institute, Inc., Honolulu.

Nedbalek, Lani. 1984. *Wahiawa: from Dream to Community*. Wonder View Press, Mililani, Hawaii.

Nickelson, Cordelia, and Thomas Jackson. n.d. Mokapū Peninsula Archaeological Area. National Register of Historic Places Nomination Form. Prepared for Marine Corps Base Hawaii. Pacific Legacy, Inc., Kailua.

________. 2007. Waimānalo Archaeological District. National Register of Historic Places Nomination Form. Prepared for Marine Corps Base Hawaii. Pacific Legacy, Inc., Kailua.

Nickelson, Cordelia, and Melissa Kirkendall. 2008a. Site 50-80-11-2886. National Register of Historic Places Nomination Form. Prepared for Marine Corps Base Hawaii. Pacific Legacy, Inc., Kailua.

________. N2008b. Site 50-80-11-4933. National Register of Historic Places Nomination Form. Prepared for Marine Corps Base Hawaii. Pacific Legacy, Inc., Kailua.

________. 2008c. Site 50-80-11-4623. National Register of Historic Places Nomination Form. Prepared for Marine Corps Base Hawaii. Pacific Legacy, Inc., Kailua.

________. 2008d. Site 50-80-11-4624. National Register of Historic Places Nomination Form. Prepared for Marine Corps Base Hawaii. Pacific Legacy, Inc., Kailua.

Nutting, William. September 28, 2010. Marine Corps Base Hawaii Renewable Energy Initiatives. Presentation at the Energy Expo.

O'Day, Patrick. 2007. Archaeological Survey and Testing for the Pali Kilo II Historic Preservation Project, U.S. Marine Corps Base Hawaii, Kaneohe Bay (MCBH-KB), O'ahu Island, Hawai'i. Prepared for U.S. Army Engineering District, Honolulu. International Archaeological Research Institute, Inc., Honolulu.

O'Hare, Constance, and Jane Allen. 2002. Letter Report to Commander, Pacific Division Naval Facilities Engineering Command re: Historic Preservation Services, Officers' Club, Marine Corps Base Hawaii (MCBH) Kaneohe Bay, Kane'ohe, O'ahu, Hawai'i (Contract

No. N62742-97D-3502; Task Order 0015). AMEC Earth and Environmental, Honolulu.

O'Rourke, Laura. 2004. [draft summary] *Phase II Archaeological Investigation in Kahuku Training Area, U.S. Army Garrison, Primary Assembly Area 1 (PAA 1), Waiale'e and Pahipahi'ālua Ahupua'a, Island of O'ahu, Hawai'i*. Prepared for Directorate of Public Works, Environmental Division, U.S. Army Garrison, Hawaii. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

Orr, Maria. 2004. *Cumulative Cultural Impact Study/Assessment, Desktop Study and Ethnographic Survey, NASA W.M. Keck Observatory Outrigger Telescopes, Mauna Kea, Kaohe and Humu'ula Ahupua'a, Moku of Hamakua and Hilo, Hawai'i*. Prepared for International Archaeological Research Institute, Inc. (IARII), National Aeronautics and Space Administration (NASA), Tetra Tech, Inc., and Science Applications International Corporation (SAIC).

Paliwoda, Gary. 1990. Hawaiian Coast Defenses. *Coast Defense Study Group News*, Appendix 3, pp. 33-38.

Petersen, John A., William Burdick, and Coral Rasmussen. 2004. *Holocene Landscapes of Waimānalo Bay: Archaeological Testing in the Anti-Tank Trap Area, Marine Corps Training Area Bellows, O'ahu, Hawai'i*. Prepared for U.S. Department of the Navy, Naval Facilities Engineering Command, Pacific. International Archaeological Research Institute, Inc., Honolulu.

PHRI. 1995. *Mōkapu Peninsula Oral History Study, Pu'u Hawai'i Loa Family Housing*. Prepared for Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D., Inc., Hilo.

________. 1999. *Cultural Impact Assessment Study. Native Hawaiian Cultural Practices, Features, and Beliefs Associated with the University of Hawai'i Mauna Kea Science Reserve Master Plan Project Area. University of Hawai'i Mauna Kea Science Reserve Master Plan, Mauna Kea Science Reserve and Hale Pōhaku. Technical Report for Environmental Impact Study*. Prepared for University of Hawaii—Institute for Astronomy, c/o Group 70 International. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Pietrusewsky, Michael. 1997. A Partial Skeleton from the Aircraft Rinse Facility, Marine Corps Air Station, Kaneohe Bay, Hawai'i. Appendix A, in Lisa Anderson, *Emergency Data Recovery in Conjunction with Milcon Project P-541 Aircraft Rinse Facility at Marine Corps Base Hawaii (MCBH), Kaneohe Bay, O'ahu, Hawai'i*. Prepared for U.S.

Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Price-Beggerly, Patricia. 1987. *Archaeological Monitoring at Nuʻupia ʻEkolu Pond and Paʻakai Pond/Salt Works, During Nuʻupia Pond Improvement Project, Kaneohe Marine Corps Air Station, Kaneʻohe, Oʻahu, Hawaiʻi*.

Prishmont, Laura Ann, and Lisa Anderson. 2000. *Archaeological Subsurface Testing in Conjunction with the Airfield Runway Repairs Project (ARRP) in the Mōkapu Burial Area, Marine Corps Base Hawaii, Kaneohe Bay, Oʻahu, Hawaiʻi*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Prishmont, L.A., J. Allen, and S.D. Clark. 2001. *Archaeological Monitoring in Support of the Base Realignment and Closure (BRAC) Program Relocating Barbers Point Naval Air Station Operations to Marine Corps Base Hawaii Kaneohe Bay, Oʻahu Island, Hawaiʻi.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Puette, Seamus T., and Windy K. McElroy. 2004. *Archaeological Monitoring Report for Soil and Groundwater Investigation at the Marine Corps Training Area at Bellows (MCTAB)*. Prepared for CH2M Hill. Thomas Dye & Colleagues, Archaeologists, Inc., Honolulu.

Pukui, Mary K. and Samuel H. Elbert. 1986. *Hawaiian Dictionary.* University of Hawaii Press, Honolulu.

Pukui, Mary K, Samuel H. Elbert, and Esther T. Mookini. 1974. *Place Names of Hawaii.* University Press of Hawaii, Honolulu.

Rand National Defense Research Institute. 2011. *Alternative Fuels for Military Application.*

Rasmussen, Coral M. 2007a. Archaeological Screening and Monitoring in a Portion of Marine Aircraft Control Squadron II (MACS II), MCBH Kaneohe Bay, Oʻahu, Hawaiʻi. Portion of TMK 4-4-008:001. With a contribution by Rona Ikehara-Quebral. Prepared for U.S. Department of the Navy, Naval Facilities Engineering Command, Pacific. International Archaeological Research Institute, Inc., Honolulu.

________. 2007b. *Archaeological Monitoring in Support of Project KB0334200R to Construct a Fuel Tanker Truck Unloading Containment Structure at Hangar 105, Marine Corps Base Hawaii, Kaneʻohe Bay, Oʻahu, Hawaiʻi*. Prepared for U.S. Department of the Navy, Naval Facilities Engineering Command, Pacific. International Archaeological Research Institute, Inc., Honolulu.

________. 2008. *Bellows Field: A Background History and Assessment of the Southern Runway Complex, Marine Corps Training Area Bellows, U.S. Marine Corps Base Hawaii*. Environmental Compliance and Protection Division, Marine Corps Base Hawaii.

Rechtman, Robert B., and Thomas R. Wolforth. 2000. Site 50-80-11-4933: Limited Data *Recovery at a Prehistoric Site on Mōkapu Peninsula*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Reinman, F.M., and J.J. Pantaleo. 1998a. *Redleg Trail Archaeological Investigations for the Legacy Resource Management Program at Pohakuloa Training Area, Hawaiʻi Island*. Prepared for U.S. Army Engineer District, Honolulu. Garcia and Associates, Honolulu. [revision of Shapiro, Shapiro, and Cleghorn 1998].

________. 1998b. *Archaeological Investigations of Two Work Areas for the Legacy Resource Management Program at Pohakuloa Training Area, Hawaiʻi Island, Hawaiʻi*. Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. Garcia and Associates, Honolulu. [revision of Shapiro and Cleghorn 1995].

Rieth, Timothy. 2008. *Archaeological Inventory Survey for the Kalaupapa Airport Fenceline and ARFF Station, Makanalua Ahupuaʻa, Island Of Molokaʻi, Hawaiʻi*. Prepared for Leo A. Daly. International Archaeological Research Institute, Inc., Honolulu.

Roberts, A.K.S., K. Brown, and A. Buffum. 2004. *Archaeological Survey of Training Areas 5 and 21 and Eligibility Evaluations of Volcanic Glass Quarry Sites in the Vicinity of Redleg Trail (Range 10), U.S. Army Pohakuloa Training Area, Island of Hawaii*. Prepared for U.S. Army Engineer District, Honolulu. Contract No. DACA83-10-D-0013, T.O. 0005. Garcia and Associates, Honolulu.

Roberts, A.K.S., K.S. Brown, and E.W. West. 2002. *Archaeological Monitoring and Sampling for Outside Cable Rehabilitation (OSCAR) Project, Marine Corps Base Hawaii (MCBH-KB), Kaneohe Bay, Koʻolaupoko District, Island of Oʻahu, Hawaiʻi.* Prepared for U.S. Army Corps of Engineers, Honolulu District. Garcia and Associates, Honolulu.

Roberts, A.K.S., S. Roberts, and M. Desilets. 2004. *Archaeological Reconnaissance of Training Areas 1, 3, and 4, U.S. Army Pohakuloa Training Area, Island of Hawaii, Hawaii*. Prepared for U.S. Army Engineer District, Honolulu. Contract No. DACA83-10-D-0013, T.O. 0013. Garcia and Associates, Honolulu.

Roberts, A.K.S., J.J. Robins, and A. Buffum. 2004. *Archaeological Surveys of Proposed Training Areas for the Stryker Brigade Combat Team, U.S. Army Pohakuloa Training Area*. Contract No. DACA83-10-D-0013, T.O. 0007. Prepared for U.S. Army Engineer District, Honolulu. Garcia and Associates, Honolulu.

Robins, Jennifer. 1999. *Archaeological Monitoring of Grading and Excavations Associated with the AQM-37 Facility Construction, Pacific Missile Range Facility, Barking Sands, Waimea Ahupuaʻa, Kona District, Kauaʻi, Hawaiʻi*. Prepared for U.S. Department of the Navy, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Robins, Jennifer, and A.L. Gonzalez. 2006. *Phase II Archaeological Research of Proposed Battle Area Complex (BAX) and Anti-Armor Live Fire and Training Range (AALFTR) Training Areas for Stryker Brigade Combat Team (SBCT), U.S. Army Pohakuloa Training Area, Island of Hawaii*. Prepared for U.S. Army Engineer District, Honolulu. Contract No. DACA83-01-D-0013, T.O. 0014. Garcia and Associates, Honolulu.

Robins, Jennifer, and Robert Spear. 1997a. *Cultural Resources Inventory Survey and Limited Testing of the Schofield Barracks Training Areas for the Preparation of a Cultural Resource Management Plan for U.S. Army Training Ranges and Areas, Oʻahu Island, Hawaiʻi*. Volumes I and II. Prepared for U.S. Army Corps of Engineers, Honolulu District. Contract No. DACA83-95-D-0004, T.O. 0004. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

________. 1997b. *Cultural Resources Inventory Survey and Limited Testing, Phase II, of the U.S. Army Schofield Barracks Training Areas for the U.S. Army Garrison Hawaiʻi Ecosystem Management Program, Island of Oʻahu, Hawaiʻi*. Honolulu. Prepared for U.S. Army Corps of Engineers, Honolulu District. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

________. 2002a. *Cultural Resources Inventory Survey and Limited Testing of the Schofield Barracks Training Areas for the Preparation of a Cultural Resource Management Plan for US Army Training Ranges and Areas, O'ahu Island*. Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. Contract No. DACA83-95-D-0004, T.O. 0004. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

________. 2002b. *Cultural Resources Inventory Survey and Limited Testing, Phase II, of the U.S. Army Schofield Barracks Training Areas for the U.S. Army Garrison Hawaii Ecosystem Management Program, Island of Oʻahu, Hawaiʻi*. Prepared for U.S. Army Corps of Engineers, Honolulu District. Contract No. DACA83-95-D-0004, T.O. 0017. Scientific Consultant Services/Cultural Resource Management Services, Honolulu.

Robins, J.J., K.A. Desilets, A.L. Gonzales, and A. Roberts. 2007. *Intensive Phase II Survey for Significance Determinations of Cultural Resources, Keamuku Land Acquisition Area (WPAA) for the Stryker Brigade Combat Team (SBCT), U.S. Army Pohakuloa Training Area, Hawaii Island*. Prepared for U.S. Army Engineer District, Honolulu. Contract No. DACA83-03-D-0011, T.O. 0003. Garcia and Associates, Honolulu.

Rosendahl, Paul H. 1977. *Archaeological Inventory and Evaluation Report for Installation for U.S. Army Support Command, Hawaii (USASCH), Part I and II*. Prepared for U.S. Army Support Command, Hawaii. Department of Anthropology, B.P. Bishop Museum, Honolulu.

________. 1999. *Archaeological Monitoring of Trench Excavations and Testing for Phase III (KB357MS) Repairs to Sanitary Sewer System, Marine Corps Base Hawaii Kaneohe Bay, O'ahu.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Ruzicka, Dee, and Patrick O'Day. 2005. Mokapu House Lots Archaeological District, U.S. Marine Corps Base, Hawaii, Kaneohe Bay, O'ahu Island, Hawai'i. National Register of Historic Places Registration Form. Prepared for U.S. Department of the Navy. Mason Architects and International Archaeological Research Institute, Inc., Honolulu.

Sahlins, Marshall. 1992. Anahulu: The Anthropology of History in the Kingdom of Hawaii, Volume One Historical Ethnography. University of Chicago Press, Chicago.

Schilz, Allan. 1996. *Cultural Resource Management Plan, Marine Corps Base Hawaii Kaneohe Bay, Island of O'ahu, Hawai'i*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Schilz, Allan, and Jane Allen. 1996. *Archaeological Monitoring and Data Recovery for Negation of Adverse Effect of KB-038M. Replace Potable Water Mains, and Site 50-80-11-4933, Marine Corps Base Hawaii Kaneohe Bay, O'ahu, Hawai'i*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Schilz, Allan, and S. Dies. 1996. *Archaeological Survey and Testing for Rappel Training Tower and the Archaeological Monitoring of Construction for the Leadership Reaction Course/Gas Chamber at LZ Boondocker/AAV, MCAS Kaneohe Bay*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Schmitt, Robert C. 1973. *The Missionary Censuses of Hawaii.* Pacific Anthropological Records 20. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Schoofs, Robert. 1978. *Pioneers of the Faith. History of the Catholic Mission in Hawaii (1827-1940)*. Louis Boeynaems, Honolulu.

Schousboe, Ragnar. 1982. *Emergency Archaeological Data Recovery from an Exposed Cultural Deposit at Ulupa'u Dune, Mokapu Peninsula, Marine Corps Air Station, Kane'ohe Bay, Ko'olaupoko, Kane'ohe, O'ahu Island.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Anthropology Department, B.P. Bishop Museum, Honolulu.

Seto, Muriel B. 1999. [draft] *Mōkapu: an Anchored Island. Mōkapu: He Mokulana*. Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. Garcia and Associates, Honolulu.

Shapiro, Lisa, and Paul Cleghorn. 1995. *Archaeological Investigations of Two Work Areas for the Legacy Resource Management Program at Pohakuloa Training Area, Hawai'i Island, Hawaii*. Prepared for U.S. Army Engineer District, Honolulu. BioSystems Analysis, Inc., Kailua.

Shapiro, L., W.A. Shapiro, and P. Cleghorn. 1998. *Redleg Trail Archaeological Investigations for the Legacy Resource Management Program at Pohakuloa Training Area, Hawai'i Island*. Prepared for U.S. Army Engineer District, Honolulu. BioSystems Analysis, Inc., Kailua.

Simonsen, Mindy, and Hallett Hammatt. 2010. *Cultural Impact Assessment for the Thirty Meter Telescope (TMT) Observatory Project and Mid-Level Facility Project, Maunakea, Ka'ohe Ahupua'a, Hāmākua District, Hawai'i Island*. Prepared for Parsons Brinckerhoff. Cultural Surveys Hawaii, Kailua.

SMS Research. 2006. Hawaii Housing Policy Study: Data Tabulations, Table G-3.

Snow, Charles. 1974. *Early Hawaiians: An Initial Study of Skeletal Remains from Mokapu, Oahu*. University Press of Kentucky, Lexington.

Soehren, Lloyd J. 1965-1967. Field Notes. Department of Anthropology, B.P. Bishop Museum. Honolulu, Hawaii.

Social Research Pacific. 2002. [draft] *Planning Level Oral History Survey of Traditional Cultural Properties on US Army Pōhakuloa Training Area, Hawai'i Island*. Prepared for U.S. Army Engineer District, Honolulu. Social Research Pacific, Inc., Kailua.

State of Hawaii, Department of Business, Economic Development and Tourism (DBEDT). *2010 State of Hawaii Data Book.* Available online at http://hawaii.gov/dbedt/info/economic/databook/

________. 2009. *Economic Development and Tourism, 2005 State Input-Output Study.*

State of Hawaii, Department of Education (DOE). November 2010. *Iliahi Elementary School: School Status and Improvement Report. School Year 2009–10.* http://arch.k12.hi.us/PDFs/ssir/2010/Central/SSIR210-2.pdf. Accessed March 2011.

________. School enrollment. http://lilinote.k12.hi.us/STATE/COMM/DOEPRESS.NSF/a1d7af052e94dd120a2561f7000a037c/82e939b60ecbec820a2577c00081dc60?OpenDocument. Access January 2011.

State of Hawaii, Department of Health (DOH). September 23, 1996. *Community Noise Control.* Title 11, Administrative Rules, Chapter 46.

State of Hawaii, Department of Health, Office of Environmental Planning (OEP). October 1987a. *Water Quality Standard Map of the Island of Hawaii.*

________. October 1987b. *Water Quality Standards Map of the Island of Kauai.*

________. State of Hawaii, Department of Health, Office of Environmental Planning (OEP). October 1987c. *Water Quality Standards Map of the Island of Oahu.*

State of Hawaii, Department of Transportation (DOT), Airports Division. No date. http://hawaii.gov/hawaiiaviation/hawaii-airfields-airports/molokai/molokai-airport. TMK zone 5, section 2, plat 04, stamped 14 Jan 1985. Accessed on March 14, 2011.

________. June 2011. *The State of Hawaii Airport Activity Statistics by Calendar Year.*

________. March 1991. *Kalaupapa Airport Roadways and Wharf Improvements, Final Environmental Impact Statement.*

Stearns, Harold T. and Knute N. Vaksvik. May 1935. *Geology and Ground-Water Resources of the Island of Oahu, Hawaii.*

Stearns, H. T. and Macdonald, G.A., 1947. Bulletin 11, *Geology and Ground-Water Resources of the Island of Molokai, Hawaii.* Hawaii Division of Hydrography.

Sterling, Elspeth P., and Catharine C. Summers. 1978. *Sites of Oahu*. Bishop Museum Press, Honolulu.

Stoddard, C.W. 1894. *Hawaiian Life – Being Lazy Letters from Low Latitudes*. F.T. Neely, Chicago.

SWCA Environmental Consultants. January 2007. *Vegetation Management Strategy for Marine Corps Training Area Bellows (MCTAB).*

________. June 2011. *Natural Resource Surveys in Support of the MV-22/H-1 EIS.* Draft.

Taomia, Julie. 2008. *Cultural Resources Management Projects Performed at the Pohakuloa Training Area, Island of Hawai'i, Hawai'i*. Prepared for U.S. Army Garrison-Hawaii. Pacific Cooperative Studies Unit, University of Hawai'i, Honolulu.

TetraTech. 2004. *Final Environmental Impact Statement for the Transformation of the 2nd Brigade, 25th Infantry Division (L) to a Stryker Brigade Combat Team in Hawaii*. Prepared for U.S. Department of the Army and U.S. Army Corps of Engineers, Honolulu Engineer District. Tetra Tech, Inc., Honolulu.

Tomonari-Tuggle, M.J. 1981. *North Kohala: Perception of a Changing Community*. Prepared for Division of State Parks, Department of Land and Natural Resources. M.J. Tomonari-Tuggle, Honolulu.

Tomonari-Tuggle, M.J., and Katharine Bouthillier. 1994. *Archaeology and History on the Central O'ahu Plateau: A Cultural Resources Assessment of Wheeler Army Airfield*. Prepared for Belt Collins and Associates. International Archaeological Research Institute, Inc., Honolulu.

Tomonari-Tuggle, M.J., and C. Kanani Paraso. 2002. *Cultural Assessment for the Palila Mitigation Project*. Prepared for Federal Highway Administration, Central Federal Lands Highway Division. International Archaeological Research Institute, Inc., Honolulu.

Tomonari-Tuggle, M.J., and Ann Yoklavich. 2005. *Integrated Cultural Resources Management Plan for the Pacific Missile Range Facility (PMRF), Island of Kaua'I, State of Hawai'i*. Prepared for Commander, Navy Region Hawaii. International Archaeological Research Institute, Inc., Honolulu.

Tomonari-Tuggle, M.J., H.D. Tuggle, D.E. Duensing, C. Magnuson, and U.K. Prasad. 2001. *Fire on the Land: Archaeology, Architecture, and Oral History of Former Naval Air Station Puunene, Pulehunui, Maui*. Prepared for Edward K. Noda and Associates. International Archaeological Research Institute, Inc., Honolulu.

Tuggle, H. David. 1997. *Archaeological Services in Support of the Final Environmental Impact Statement for Proposed Expansion of Military Training and the Construction of Improvements to Existing Recreational Resources at Bellows Air Force Station, Waimānalo, Hawai'i. Task 1: Literature Review of the Cultural Resources of the Bellows Area.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. International Archaeological Research Institute, Inc., Honolulu.

Tuggle, H. David. 2000 *Planning Issues in the Process of Repatriation of Human Skeletal Remains from Mōkapu Peninsula, Marine Corps Base Hawaii, Kāne'ohe Bay, Hawai'i.* Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division. International Archaeological Research Institute, Inc., Honolulu.

________. 2002. *A Preliminary Summary of the Bowles Records Concerning Mōkapu Excavations, O'ahu*. Prepared for U.S. Army Engineer District, Honolulu. International Archaeological Research Institute, Inc., Honolulu.

Tuggle, H. David, and Robert J. Hommon. 1986. *Historic Property Inventory, Marine Corps Air Station, Kaneohe Bay: History, Survey, and Site Descriptions.* U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command.

Tuggle, D.H. and M.J. Tomonari-Tuggle. 2004. A *Study of Potential Native Hawaiian Traditional Cultural Places, Navy Region Hawaii*. Prepared for Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Contract No. N62742-97-D-3511, T.O. 0008. International Archaeological Research Institute, Inc., Honolulu.

Tuggle, D.H., M.J. Tomonari-Tuggle, D.E. Duensing, C. Magnuson, and U.K. Prasad. 2001. *Fire on the Land: Archaeology, Architecture, and Oral History of Former Naval Air Station Puunene, Pulehunui, Maui*. Prepared for Edward K. Noda and Associates, Honolulu. International Archaeological Research Institute, Inc., Honolulu.

U.S. Army Corps of Engineers (USACE). September 2005. *Oahu Wetlands of USARHAW.*

________. 2006. *Integrated Cultural Resources Management Plan (ICRMP) Marine Corps Base Hawaii (MCBH) 2006 – 2010*. Prepared for Installation Commander, Marine Corps Base Hawaii. Wil Chee Planning and Environmental, Honolulu.

________. July 2009. *Wetlands of Marine Corps Base Hawaii, Island of Oahu, Hawaii.*

________. June 2010. Wetlands of MCBH Island of Oahu and the revised Final.

U.S. Department of Agriculture, Soil Conservation Service (SCS). August 1972. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.*

________. December 1973. Soil Survey of the Island of Hawaii.

U.S. Department of Defense, Pacific Command (PACOM). December 1995. *Final Environmental Impact Statement and Land Use and Development Plan for Bellows Air Force Station.*

U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. March 2010. *Public Health Assessment, Schofield Barracks Wahiawa, Honolulu County, Hawaii.*

U.S. Department of Housing and Urban Development. July 12, 1979. “Environmental Criteria and Standards, Noise Abatement and Control.” 24 CFR, Part 51, Subpart B.

U.S. Department of Defense. February 2010. *Quadrennial Defense Review Report.*

U.S. Department of the Interior Geological Survey (USGS). no date. Generalized Geologic Map of Windward Oahu, Hawaii Showing Location of Selected Data Sites. Data from geologic map of Oahu, Stearns 1939.

________. 1968. Generalized Geological Map of Windward Oahu, Hawaii Showing Location of Selected Data Sites.

U.S. Department of the Interior, National Park Service (NPS), Cultural Resource. n.d. *ow to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. U.S. Department of the Interior, National Park Service, Cultural Resources

U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA). August 11, 2010. “Frequently Asked Questions.”

http://www.fema.gov/plan/prevent/fhm/fq_genhm.shtm#hm1. Accessed May 19, 2011.

FIRM. Nov 26, 2010. Map Number 1500020120F , Kauai County, Hawaii. Panel 120 of 500.

U.S. Fish and Wildlife Service (USFWS). May 2008. *Inventory of Coastal and Marine Resources at <fig 3-6>MCB Hawaii Kaneohe Bay, Mokapu Peninsula, Oahu Island, Hawaii.*

U.S. Fish and Wildlife Service (USFWS), Pacific Island Fish and Wildlife Office. December 23, 2003. *Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transformation of the 2nd Brigade 25th infantry Division (Light), U.S. Army Installation, Island of Hawaii.* (1-2-2003-F-04)

U.S. Marine Corps (USMC). December 2004. *Aviation Training and Readiness Manual, AH-1.* Marine Corps Order 3500.48A.

________. February 2009a. *National Environmental Policy Act (NEPA) Manual.*U.S. Marine Corps (USMC). October 2009b. *West Coast Basing of the MV-22 Final Environmental Impact Statement.*

________. March 2010. *Requirements Document.*

U.S. Marine Corps Headquarters (HQMC). October 2001. *Manpower Unit Deployment Program Standing Operating Procedures.* Marine Corps Order P3000.15B.

________. November 2006. *United States Marine Corps Bachelor Enlisted Quarters (BEQ) Campaign Plan*

________. May 2007. *UH-1Y Training and Readiness Manual.* NAVMC 3500.20.

________. June 2008. *CH-53 Training and Readiness Manual.* NAVMC 3500.47.

________. February 2009a. *United States Marine Corps National Environmental Policy Act (NEPA) Manual*. Version 1.0.

________. 21 May 2009b. *Environmental Compliance and Protection Manual.* Marine Corps Order P5090.2A Change 2.

________. March 2010a. *MV-22B Training and Readiness Manual.* NAVMC 3500.11B.

________. September 2010b. *FY2011 Marine Aviation Plan.*

U.S. Marine Corps, Marine Corps Air Facility Kaneohe Bay (MCAF). June 15, 2006. *BASH Plan.*

U.S. Marine Corps, Marine Corps Base Hawaii (MCBH). Various dates. 1391s.

________. November 2006a. Final Marine Corps Base Hawaii Integrated Natural Resources Management Plan Update (MCBH INRMP) (2007–2011).

________. December 2006b. *Marine Corps Base Hawaii Master Plan.*

________. July 2010a. *Plus-Up Development Plan.* Draft. Basic Facility Requirements (BFRs) prepared for the Plus-up Development Study and SF1391 MILCON documents prepared for the aviation-related facilities at MCB Hawaii Kaneohe Bay.

________. *Marine Corps Base Strategic Plan 2009-2013*. http://www.mcbh.usmc.mil/Strat/MV.htm. Accessed November 10, 2010.

U.S. Marine Corps, Marine Corps Base Hawaii (MCBH). 2011a. Electrical usage data for FY08 to FY10.

U.S. Marine Corps, Marine Corps Base Hawaii (MCBH). January 20, 2011b. Map of Marine Corps Base Hawaii Kaneohe Bay, Oahu, Hawaii (Base Map).

Unified Facilities Criteria (UFC). January 2005. *Facility Planning Criteria for Navy/Marine Corps Shore Installations.* UFC 2-000-05N.

________. November 2008. *Airfield and Heliport Planning and Design.* UFC 3-260-01.

________. December 2007. *Sustainable Development.* UFC 4-030-01.

________. November 2010. *Low Impact Development.* UFC 3-210-10.

________. Updated June 2011. *DoD Facilities Pricing Guide for FY 2010.* UFC 3-701-01.

Vermeer, M., S. Rahmstorf. 2009. “Global sea level linked to global temperature”. Proceedings of the National Academy of Sciences, 106.51:21527-21532.

Walker, Chester P., and Alex E. Morrison. 2010. *Geophysical Survey at the Marine Corps Training Area Bellows (MCTAB), Waimānalo, Oʻahu, Hawaiʻi*. Prepared for U.S. Department of the Navy, Naval Facilities Engineering Command, Pacific. International Archaeological Research Institute, Inc., Honolulu.

Watts, Jennifer. 1971. Mokapu Burial Area. National Register of Historic Places Nomination Form. In the files of the State Historic Preservation Division, Department of Land and Natural Resources, Kapolei.

Webster, William. 1851. [map] Palapala ana aina o Mokapu-Heeia ma Koolaupoko, Oahu ka aina o ka mea hanohano A. Paki. Hawaiian Government Survey. Government Register Map 121. In the files of the Hawaii State Survey Office, Honolulu.

Welch, David. 1993. *Archaeological Survey and Testing for the Saddle Road Improvement Project, Pohakuloa Area, Island of Hawai'i, Hawai'i*. Prepared for Central Federal Lands Highway Division, Federal Highways Administration. International Archaeological Research Institute, Inc., Honolulu.

Whitehead, B., P. Cleghorn, and J. McIntosh. 2005. *Archaeological Inventory Survey for Improvements to the Drum Road: Helemano Military Reservation to Kahuku Training Area, Oahu, Hawaii*. Prepared for Wil Chee Planning, Inc. Contract No. DACA83-00-D-0012, T.O. 0026. Pacific Legacy, Inc., Kailua.

Williams, Scott. 2002a. *Archaeological Reconnaissance Survey U.S. Army Pohakuloa Training Area (PTA) for the U.S. Army Garrison, Hawaii, Ecosystem Management Program, Hawai'i Island, Hawai'i*. With Rich Nees, Fred Reinman, Jadelyn Moniz-Nakamura, and Linda Scott-Cummings. Prepared for U.S. Army Corps of Engineers. Ogden Environmental and Energy Services Co., Inc., Honolulu.

________. 2002b. *Ecosystem Management Program Cultural Resources Inventory Survey of Previously Unsurveyed Areas, Redleg Trail Vicinity, US Army Pohakuloa Training Area, Island of Hawai'i*. Prepared for U.S. Army Corps of Engineers. Ogden Environmental and Energy Services Co., Inc., Honolulu.

Williams, Scott, and Tomasi Patolo. 1998a. *Subsurface Survey and Boundary Delimitation of the Mokapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, O'ahu, Hawai'i.* Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Ogden Environmental and Energy Services Co., Inc., Honolulu.

________. 1998b. *Archaeological Inventory Survey of a Portion of the Kahuku Training Area, for the Legacy Resource Management Program, O'ahu Island, Hawai'i*. Prepared for U.S. Army Engineer District, Honolulu. Contract No. DACA83-91-D-0025, T.O. 0017. Ogden Environmental and Energy Services Co., Inc. [final report based on Williams and Patolo 1995]

Wolforth, T., G. Escott, and L. McGerty. 2004. Inventory Survey for the Saddle Road Extension: Investigations into Resource Extraction in the Middle Elevations of Waikōloa Ahupuaʻa in Kohala, and Puʻu Anahulu Ahupuaʻa in Kona. Prepared for Okahara and Associates. Scientific Consultant Services, Honolulu.

Wolforth, Thomas, and Robert Rechtman. 1997. *Archaeological Subsurface Testing in Support of BRAC Projects P276T Navy Operations and Training Facility and P288T Hazmat/Hazwaste Facility*. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Wulzen, Warren, and Alan Haun. 1996. *Archaeological Monitoring of Trenching for Water Pipe in Support of Project KB956RS and Fence Post Excavation for Expansion of the Canine Obstacle Course Buildings 1095 and 1096, Marine Corps Base Hawaii, Kaneohe Bay*. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Wulzen, W., P. Jensen, and P.H. Rosendahl. 1997. *Archaeological Reconnaissance Survey Pacific Missile Range Facility Barking Sands and Makaha Ridge. Land of Waimea, Waimea District, Island of Kauai*. Prepared for U.S. Department of the Navy, Pacific Division, Naval Facilities Engineering Command. Paul H. Rosendahl, Ph.D., Inc., Hilo.

Wyle Laboratories. Wyle Laboratories. October 2008. *Aircraft Noise Study for Marine Corps Base Hawaii, Kaneohe Bay, Hawaii.* Wyle Report WR 08-13.

________. March 2012. *Aircraft Noise Study for Marine Corps Base Hawaii, Kaneohe Bay, Hawaii.* WR 11-08.

Y. Ebisu and Associates. March 2001. *Acoustic Study for the Environmental Impact Statement for Basing of MV-22 and H-1 Aircraft in Support of III MEF Elements in Hawaii (Working Draft).* Draft.

Zulick, Loren. 2005. Natural Resources Survey—Pahipahialua Fenceline Survey, Kahuku Training Area. Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii.

Zulick, Loren, and David Cox. 2002. Memorandum for Record. Subject: Trip Report, Survey of Proposed Improvement at PAA #1, Kahuku Training Area (KTA), Oahu Island, Hawaii. Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii.

CHAPTER 10

Distribution

Distribution

10.1 DRAFT EIS DISTRIBUTION

10.1.1 FEDERAL, STATE, AND COUNTY AGENCIES

Federal Agencies	
Advisory Council on Historic Preservation	
National Park Service	Hawaii Volcanoes National Park
National Park Service	Kalaupapa National Historical Park
National Park Service	Pacific West Region Office
National Park Service	Puʻukohola Heiau National Historic Site
U.S. Army Corps of Engineers	Pacific Ocean Division
U.S. Environmental Protection Agency	Pacific Islands Contract Office
U.S. Environmental Protection Agency	Region IX
U.S. Federal Aviation Administration	
U.S. Fish and Wildlife Service	Pacific Islands Ecological Field Service Office
U.S. National Marine Fisheries Service	
US Air Force	

State Agencies	
Department of Agriculture	Office of the Chair
Department of Business, Economic Development and Tourism	Office of the Director
Department of Business, Economic Development and Tourism	Coastal Zone Management Program
Department of Education	Office of Superintendent
Department of Education	Waimanalo Elementary and Intermediate School
Department of Education	Castle/Kahuku Complex
Department of Education	Kailua/Kalaheo Complex
Department of Hawaiian Home Lands	Office of the Director

State Agencies	
Department of Health	Office of Environmental Quality Control
Department of Health	Environmental Health Office
Department of Health	Kalaupapa Settlement
Department of Land and Natural Resources	Office of the Chair
Department of Land and Natural Resources	State Historic Preservation Division
Governor's Molokai Community Advisory Council	
Governor's Office West Hawaii Liaison	
Hawaii Island Burial Council	
Heeia State Park	
Oahu Island Burial Council	
Office of Hawaiian Affairs	Office of the Executive Director
Office of Mauna Kea Management	
Department of Transportation	Office of the Director
University of Hawaii	Environmental Center
University of Hawaii	Hawaii Institute of Marine Biology
University of Hawaii	Windward Community College

County Agencies	
City & County of Honolulu	Department of Planning & Permitting
City & County of Honolulu	Department of Parks & Recreation
City & County of Honolulu	Department of Environmental Services
City & County of Honolulu	Police Department
City & County of Honolulu	Department of Transportation Services
City & County of Honolulu	Board of Water Supply
City & County of Honolulu	Honolulu Fire Department

County Agencies	
County of Hawaii	Planning Department
County of Hawaii	Department of Water Supply
County of Hawaii	Department of Public Works
County of Hawaii	Department of Environmental Management
County of Hawaii	Office of the Mayor
County of Hawaii	Fire Department
County of Hawaii	Planning Department
County of Kauai	Department of Water Supply
County of Kauai	Department of Public Works
County of Kauai	Fire Department
County of Kauai	Department of Parks and Recreation
County of Kauai	Department of Planning
County of Maui	Department of Parks and Recreation
County of Maui	Department of Planning
County of Maui	Department of Environmental Management
County of Maui	Department of Transportation
County of Maui	Department of Water Supply
Molokai Planning Commission	

1 ### 10.1.2 ELECTED OFFICIALS

Federal Elected Officials				
Rep.	Colleen		Hanabusa	U.S. Congresswoman - 1st District of Hawaii
Rep.	Mazie	K.	Hirono	U.S. Congresswoman - 2nd District of Hawaii
Sen.	Daniel	K.	Inouye	United States Senator for Hawaii
Sen.	Daniel	K.	Akaka	United States Senator for Hawaii

State Elected Officials			
Neil		Abercrombie	Governor
Mark	M.	Nakashima	1st Representative District
Cindy		Evans	7th Representative District
Mele		Carroll	13th Representative District
Dee		Morikawa	16th Representative District
Jo		Jordan	45th Representative District
Gil		Riviere	46th Representative District
Jessica		Wooley	47th Representative District
Ken		Ito	48th Representative District
Pono		Chong	49th Representative District
Cynthia		Thielen	50th Representative District
Chris		Lee	51st Representative District
Malama		Soloman	1st Senatorial District
J.	Kalani	English	6th Senatorial District
Ronald	D.	Kouchi	7th Senatorial District
Clayton		Hee	23rd Senatorial District
Jill	N.	Tokuda	24th Senatorial District
Pohai		Ryan	25th Senatorial District

County Elected Officials			
Peter	B.	Carlisle	City and County of Honolulu, Mayor
Tom		Berg	City and County of Honolulu, Council District 1
Ernest	Y.	Martin	City and County of Honolulu, Council District 2
Ikaika		Anderson	City and County of Honolulu, Council District 3
Nestor	R.	Garcia	City and County of Honolulu, Council District 9

County Elected Officials			
William	P.	Kenoi	County of Hawaii, Mayor
Bernard	P.	Carvalho	County of Kauai, Mayor
Alan	M.	Arakawa	County of Maui, Mayor
Danny	A.	Mateo	County of Maui, Council Chair
Dominic		Yagong	County of Hawaii, Council District 1

City and County of Honolulu Neighborhood Boards
Koolauloa Neighborhood Board No. 28
Kahalu'u Neighborhood Board No. 29
Kaneohe Neighborhood Board No. 30
Kailua Neighborhood Board No. 31
Waimanalo Neighborhood Board No. 32

10.1.3 ORGANIZATIONS AND INDIVIDUALS

Organizations
Ali'i Nui, Heiau O Na Ali'i
Aloha First
Association of Hawaiian Civic Clubs
AT3, Inc.
Big Island Weekly
Boyd Ohana
Chamber of Commerce
Cinnamon's Family Restaurant

Organizations
Diamond Ohana
Friends for Maka Wolfgramm
Gathering of Eagles
Hawaii Island Chamber of Commerce
Hawaii Island District Council of Hawaiian Civic Clubs
Hawaii Island Economic Development Board
Hawaii Tribune Herald

Organizations
Hawaiian Electric Company, Inc.
Hawaii's Thousand Friends
Historic Hawaii Foundation
Honolulu Star Advertiser
Hui Malama I Na Nupuna O Hawai'i Nei
Kailua Chamber of Commerce
Ka Lahui Hawaii
Kahu Ku Mauna
Kaneohe Bay Regional Council
Kaneohe Business Group
Kaneohe Community Family Center
Kaneohe Outdoor Circle
Kaneohe Rotary Club
Kauai Chamber of Commerce
KCJ
Kekoolani Ohana
Kekumano Ohana
Key Project (Kahaluu)
Kiewit Building Group Inc.
Kona-Kohala Chamber of Commerce
Koolauloa Hawaiian Civic Club
Koolaupoko Hawaiian Civic Club
Life of the Land Hawaii
Malama Waikoloa Nightingales
Malu 'Aina
Marimed Foundation

Organizations
Maui News
Mauna Kea Management Group
Mike Mead Consulting, LLC
Molokai Community Service Council
Molokai Dispatch
Molokai Invasive Species Committee
Nation of Hawaii
Navy League of Hilo
Olds Ohana
Ortiz Ohana
Paoa Kea Lono Ohana
Paguyo Ohana
Parker Ranch
Prince Kuhio Hawaiian Civic Club
Pu'uhonua O Waimanalo Village
Royal Order of Kamehameha
Sierra Club
Temple of Lono
T.S. Dye + Colleagues, Archaeologists, Inc.
Waikalua Loko Fishpond Preservation Society
Waikoloa Village Association
Waimanalo Health Center
Waimanalo Health Center
Windward Rotary Club
YWCA of Oahu

Individuals		
First	**Middle**	**Last**
Edward	K	Ahuna
Ellen	L.	Akaka
Paul		Akau
Lucy		Akau
Nani		Akeo
Karen		Ashley
Anita		Balch
Lee		Ballard
J.G. (Guy)		Ballou
Alexandra		Bernardi
Jade		Bruhjell
Sheryl		Buecher
John		Clements
David		Clymer
Kimo		Corstorphine
Ron & Millie		Darby
Gene		Dashiell
Claire		Durham
Robert		Fernandez
Kina		Fernandez
Anne	E.	Field Gomes
John		Fox
Ed		Furuike
David R. and Sue P.		Gary
Anika		Glass
David	B.	Gomes
Robert		Green

Individuals		
First	**Middle**	**Last**
Bette		Green
Kirk		Greenman
Himeo		Hanato
Minoru		Hanato
Cory		Harden
Mike & Brenda		Hikalea
Carol		Hinton
Nelson		Ho
Pete		Hoffman
Gail		Jackson
Andrew	M.	Jamila
Ryan		Kalama
Kimberly	A.M.	Kalama
Ted & Lena		Kanemori
Randy		Kennedy
Joe		Kennedy
Kathryn	Lapinski	Kennedy
Dave		Kisor
April		Lee
Danny		Li
Don		Mapes
John		Moishe
Marilyn		Morita
Salli		Morita
Janet		Ness
Michael & Arline		O'Brien
John & Ruth		Ota
Leland		Pa

Individuals		
First	**Middle**	**Last**
Janice		Palma-Glennie
Margaret		Philpott
Elayne	"Polly"	Pool
Kelly		Proctor
Mary		Protheroe
Susan		Quick
Stann		Reiziss
Jean	S.	Reiziss
Walter		Ritte
William		Rogers
Joe		Ryan
Jana		Sasada
Robert & Winifred	J.	Simmons
Bill		Simonsma
Donna		Sullivan

Individuals		
First	**Middle**	**Last**
Ryan		Tam
Ryan		Terayama
Glenn	I.	Teves
Kimbal		Thompson
Robert		Titcomb
Mark	J.	Valencia
Pat		Valenti
Bob		Vericker
Dwight	J.	Vicente
Erich		Wida
Maka		Wolfgramm
Brian		Yamada
Karen		Yamada
Tammy		Yamanoha
John		Young

10.1.4 PUBLIC LIBRARIES

Public Libraries
Island of Hawaii: Hilo, Kailua-Kona, North Kohala (Kapaau), Thelma Parker (Kamuela), UH-Hilo
Island of Kauai: Lihue, Waimea, Kauai Community College
Island of Maui: Kahului, Kihei, Wailuku, UH Maui College
Island of Molokai: Molokai (Kaunakakai)
Island of Oahu: Hawaii State Library, Kahuku, Kailua, Kaneohe, Mililani, Wahiawa, Waimanalo, Windward Community College, UH Manoa – Hamilton Library

10.2 FINAL EIS DISTRIBUTION

10.2.1 FEDERAL, STATE, AND COUNTY AGENCIES

Federal Agencies	
Advisory Council on Historic Preservation	Office of the Executive Director
U.S. Department of the Interior	Office of the Secretary
U.S. Department of the Interior	National Park Service
National Park Service	Pacific West Region Office
National Park Service	Pacific Islands Office
National Park Service	Hawaii Volcanoes National Park
National Park Service	Ala Kahakai National Historic Trail
National Park Service	Kaluapapa National Historical Park
National Park Service	Pu'ukohola Heiau National Historic Site
National Parks Service	National Historic Landmark Program
U.S. Environmental Protection Agency	Environmental Review Office
U.S. Environmental Protection Agency	Pacific Islands Contract Office
U.S. Environmental Protection Agency	Region IX
U.S. Federal Aviation Administration	
U.S. Fish and Wildlife Service	Pacific Islands Ecological Field Service Office
U.S. National Marine Fisheries Service	
Aircraft Environmental Support Office	Fleet Readiness Center Southwest
U.S. Army Corps of Engineers	Pacific Ocean Division
Pacific Air Force, Headquarters	

State Agencies	
Department of Agriculture	Office of the Chair
Department of Business, Economic Development and Tourism	Office of the Director

State Agencies	
Department of Business, Economic Development and Tourism	Coastal Zone Management Program
Department of Defense	
Department of Education	Office of Superintendent
Department of Education	Castle/Kahuku Complex
Department of Education	Kailua/Kalaheo Complex
Department of Education	Waimanalo Elementary and Intermediate School
Department of Hawaiian Home Lands	Office of the Director
Department of Hawaiian Home Lands	Molokai District Office
Department of Health	Environmental Health Office
Department of Health	Office of Environmental Quality Control
Department of Land and Natural Resources	Office of the Chair
Department of Land and Natural Resources	State Historic Preservation Division
Department of Land and Natural Resources	Division of State Parks, He'eia State Park
Department of Transportation	
Department of Transportation	Airports Division, Hawaii District Office
Department of Transportation	Airports Division, Maui District Office
Office of Hawaiian Affairs	Compliance Monitoring Program
Office of Hawaiian Affairs	Trustee, Molokai and Lanai
Island Burial Council	Island of Oahu
Island Burial Council	Island of Hawaii
Governor's Molokai Community Advisory Council	
Governor's Office	East Hawaii Liaison
Governor's Office	West Hawaii Liaison
Governor's Office	Kauai Liaison
University of Hawaii	Environmental Center
University of Hawaii	Windward Community College
University of Hawaii at Hilo	‘Imiloa Astronomy Center of Hawaii

County Agencies	
City & County of Honolulu	Board of Water Supply
City & County of Honolulu	Department of Environmental Services
City & County of Honolulu	Department of Facility Maintenance
City & County of Honolulu	Department of Parks & Recreation, Kaneohe District Park
City & County of Honolulu	Department of Planning & Permitting
City & County of Honolulu	Department of Transportation Services
City & County of Honolulu	Honolulu Fire Department
City & County of Honolulu	Police Department
City & County of Honolulu	Office of the Mayor
County of Hawaii	Department of Environmental Management
County of Hawaii	Department of Parks and Recreation
County of Hawaii	Department of Public Works
County of Hawaii	Department of Water Supply
County of Hawaii	Executive Branch
County of Hawaii	Hawaii Fire Department
County of Hawaii	Planning Department
County of Hawaii	Office of the Mayor
County of Kauai	Department of Parks and Recreation
County of Kauai	Department of Planning
County of Kauai	Department of Public Works
County of Kauai	Department of Water Supply
County of Kauai	Fire Department
County of Maui	Department of Environmental Management
County of Maui	Department of Parks and Recreation
County of Maui	Department of Planning
County of Maui	Department of Transportation
County of Maui	Department of Water Supply
Molokai Planning Commission	

10.2.2 ELECTED OFFICIALS

Federal Elected Officials				
Rep.	Colleen		Hanabusa	U.S. Congresswoman - 1st District of Hawaii
Rep.	Mazie	K.	Hirono	U.S. Congresswoman - 2nd District of Hawaii
Sen.	Daniel	K.	Inouye	United States Senator for Hawaii
Sen.	Daniel	K.	Akaka	United States Senator for Hawaii

State Elected Officials			
Neil		Abercrombie	Governor
Mark	M.	Nakashima	1st Representative District
Cindy		Evans	7th Representative District
Mele		Carroll	13th Representative District
Dee		Morikawa	16th Representative District
Jo		Jordan	45th Representative District
Gil		Riviere	46th Representative District
Jessica		Wooley	47th Representative District
Ken		Ito	48th Representative District
Pono		Chong	49th Representative District
Cynthia		Thielen	50th Representative District
Chris		Lee	51st Representative District
Malama		Soloman	1st Senatorial District
Green		Joshua	3rd Senatorial District
J.	Kalani	English	6th Senatorial District
Ronald	D.	Kouchi	7th Senatorial District
Clayton		Hee	23rd Senatorial District
Jill	N.	Tokuda	24th Senatorial District

State Elected Officials			
Pohai		Ryan	25th Senatorial District

County Elected Officials			
Peter	B.	Carlisle	City and County of Honolulu, Mayor
Tom		Berg	City and County of Honolulu, Council District 1
Ernest	Y.	Martin	City and County of Honolulu, Council District 2
Ikaika		Anderson	City and County of Honolulu, Council District 3
Nestor	R.	Garcia	City and County of Honolulu, Council District 9
William	P.	Kenoi	County of Hawaii, Mayor
Dominic		Yagong	County of Hawaii, Council District 1
Pilago		Angel	County of Hawaii, Council District 8
Bernard	P.	Carvalho	County of Kauai, Mayor
Furfaro		Jay	County of Kauai, Council Chair
Alan	M.	Arakawa	County of Maui, Mayor
Danny	A.	Mateo	County of Maui, Council Chair

City and County of Honolulu Neighborhood Boards
Wahiawa-Whitmore Neighborhood Board No. 26
North Shore Neighborhood Board No. 27
Koolauloa Neighborhood Board No. 28
Kahalu'u Neighborhood Board No. 29
Kaneohe Neighborhood Board No. 30
Kailua Neighborhood Board No. 31
Waimanalo Neighborhood Board No. 32

10.2.3 ORGANIZATIONS AND INDIVIDUALS

Organizations
AFSC Hawaii Area Program
‘Aha Kukaniloko/Koa Mana
Ali‘i Nui, Heiau O Na Ali‘i
Aloha First
Association of Hawaiian Civic Clubs
AT3 Inc.
Boyd Ohana
Chamber of Commerce
Cinnamon's Family Restaurant
Diamond Ohana
Flores-Case ‘Ohana
Friends for Maka Wolfgramm
Gathering of Eagles
Hawaii Institute of Marine Biology at Coconut Island
Hawaii Island Chamber of Commerce
Hawaii Island Economic Development Board
Hawaii Volcano Observatory
Hawaiian Civic Club of Wahi‘awa
Hawaiian Civic Club of Waimanalo
Hawaiian Electric Company, Inc.
Hawaiian Kingdom
Hawaiian Telcom
Hawaii Island Burial Council
Hawaii Island District Council of Hawaiian Civic Clubs

Organizations
Hawaii Peace and Justice
Hawaii's Thousand Friends
Historic Hawaii Foundation
Ho‘okipa Network - Kauai
Hui Malama I Na Kupuna O Hawaii Nei
Ka Ohana O Kaluapapa
Ka‘ala Farms Cultural Education Center
Ka Lahui Hawaii
Kahu Ku Mauna
Kailua Chamber of Commerce
Kailua Community Enhancement Club
Kaiwi Olelo O Hawaii
Kaneohe Bay Regional Council
Kaneohe Business Group
Kaneohe Community Family Center
Kaneohe Outdoor Circle
Kaneohe Rotary Club
KCJ
Kekoolani Ohana
Kekumano Ohana
Keohokalole ‘Ohana
Key Project (Kahaluu)
Kiewit Building Group Inc.
Ko‘olauloa Hawaiian Civic Club
Ko‘olaupoko Hawaiian Civic Club
Kohala Lihikai

Organizations
Kohala Merchant's Association
Kokokahi Community. Association.
Kona-Kohala Chamber of Commerce
Kupukaʻaina O Waianae Moku, Oahu
Life of the Land Hawaii
Maikaʻi Kamakani ʻO Kohala, Inc.
Malama Makua
Malama Na Kahakai Inc.
Malama Waikoloa Nightingales
MaluʻAina
ManTech International
Marimed Foundation
Mauna Kea Management Group
Mike Mead Consulting, LLC
Moanalua Gardens Foundation
Mohala Lehua Farm
Molokai Chamber of Commerce
Molokai Community Service Council
Molokai Invasive Species Committee
Na ʻOhana Papa O Mana
Na Kuʻauhau ʻo Kahiwakaneikopolei
Ka Papa O Mana
Nation of Hawaii
National Trust for Historic Preservation
Native Hawaiian Researchers Ohana
Nature Conservancy
Navy League of Hilo

Organizations
Ocean Conservation Society
Oceanic Time Warner Cable
Office of Mauna Kea Management
Olds Ohana
Ortiz Ohana
Paguyo Ohana
Paoa Kea Lono Ohana
Parker Ranch
PBR Hawaii
Peace Depot Inc.
Prince Kuhio Hawaiian Civic Center
Puʻuhonua O Waimanalo Village NB
Puʻukohola Heiau National Historic Site
Royal Order of Kamehameha I
S. Kona Pony
Sierra Club
Temple of Lono
Thomas Lab, Hawaii Institute of Marine Biology
Vietnam Vets Against War
Waha ʻOlelo ʻAha Kukaniloko
Waianae Military Civilian Adv Council
Waikalua Loko Fishpond Preservation Society
Waikiʻi Homeowners Association
Waiki'i Ranch Homeowners' Association
Waikoloa Village Association
Waimanalo Health Center

Organizations
Windward Ahupua‘a Alliance
Windward Rotary Club

Organizations
YWCA of Oahu

Individuals	
First	**Last**
Ahuna	Edward
Akaka, Jr.	Daniel
Akaka	Ellen
Akaka	Moanikeala
Akau	Lucy
Akau	Paul
Akeo	Nani
Anderson	Ross and Stefanie
Ashley	Karen
Aylett	John
Babben	Kathie
Bailey	Ken
Baku	Steffani
Balch	Anita
Ballard	Lee
Ballou	J.G. (Guy)
Barclay	Micah
Basso	Eugene
Belmarez	Jamie
Benjamin	Jonathan and Patricia

Individuals	
First	**Last**
Benson	Leinaala
Bermudez	Richard
Bernardi	Alexandra
Biederman	Carolann
Bonahan	Michael
Borden	Marty
Brigham	Cathy
Bruhjell	Jade
Buchanan	Lori
Buecher	Sheryl
Busquets	Kaikane & Kelly
Butterbaugh	Kevin
Cabral	Clive
Cachola	Fred
Callison	Todd
Cameron	Steve
Cappelle	Jane
Carey	Phil and Anita
Carlson	Mitch
Carrillo	Michal

Individuals	
First	**Last**
Carvalho	Joe
Channon	Jim
Chertavian	Vahan
Ching	Clarence
Ching	Ku
Ching	Sherrie
Chun	Debra
Clymer	David
Coates	George
Cole	William
Cordy	Nona
Corstorphine	Kimo
Coster	Robert
Cruz	Dillon
Curtis	Laura
Darby	Ron & Millie
Dashiell	Gene
Davison	David & Marietta
de Vos	Paul
Dias	Jewell
Dodson	Travis
Donham	Theresa
Dote	James
Dunn	Richard
Durham	Claire

Individuals	
First	**Last**
Econ	Lawrence
Estores	S. Joe
Fanning	Harold & Flo
Farley	Chris
Fernandez	Kina
Fernandez	Robert
Fessler	S.
Field Gomes	Anne
Fleckles	John
Fleming	Joan and Jim
Flores	E.
Ford	Kitti
Fowler	Noelani
Fox	John
Frame	Joshua
Frohmader	Margaret
Furuike	Ed
Garmon-Mitchell	Leiola
Gartland	Jim & Carol
Gary	David R. and Sue P.
Gaughen	Chris
Gebauer	Otto
Gibson	Deborah
Gilbert	Jody
Goldstein	Jack and Laurie

Individuals	
First	**Last**
Gomes	David
Grabowski	Eric & Mary Kay
Graham	Joan and Paul
Green	Bette
Green	Robert
Greenman	Kirk
Griffin	Nicole
Hagemann	Inez
Hanato	Himeo
Hanato	Minoru
Haugaard	Anne
Hayselden	Steve
Henderson	Scott & Lou Ann
Hendrickson	Karen
Hettema	Sharon
Hikalea	Mike & Brenda
Hildebrandt	Volker
Hill	James
Hilton	Eileen
Hino	Leilani
Hinton	Carol
Ho	Nelson
Hoffman	Pete
Hummel	William and Kathleen
Huyler	HW

Individuals	
First	**Last**
Isayama	Koichi & Pamela
Jackson	Brenda
Jackson	Gail
Jamila	Andrew
Kaimuloa	Kamatana
Kalama	Kimberly
Kalama	Ryan
Kalekeiki	Samuel
Kamaka	Stan & Ray
Kane	Jerry
Kanemori	Ted & Lena
Kapuna	Joey
Kau	Dagmar
Kelly	L.V.
Kennedy	Joe
Kennedy	Kathryn
Kennedy	Randy
Kisor	Dave
Kittell	Steve
Knoll	Carolyn
Krainer	Margaret
Krainer	Peter
Kremkow	Jerry
Kualii	Kaleo
Laich	Linda

Individuals	
First	**Last**
Lamb	Barry & Ava
Land	James
Larch	Linda
Lasley	Jason
Laughlin	Susan
Lee	April
Levey	Joel
Levy, M.A.	Michelle
Lewandorski	Linda
Lewis	Paul
Li	Danny
Losey	George
Lovell-Obatake	Cheryl
Lysanght	Corinne
Mapes	Don
Mark	Keona
Masterson	Thomas
Matsuoka	H. Doug
McCann	Robin
McDonald	Ruby
McGough	Kevin
McGough	Leilani
McKellar	Sherree
Meier	Alan
Mensching	Linda

Individuals	
First	**Last**
Metzler	John
Meyer	Bill & Lisa
Minton	Barbara
Mitchell	Tom and Michelle
Mizuta	Lea
Moishe	John
Molsee	Autumn
Moore	Bill
Moore	James and Laurie
Morita	Marilyn & Salli
Nakoa	Maka‘ala
Nedved	Kelly
Ness	Janet
Newell	Jacqueline
Newland	Star
Nichols	Vanessa
Nuntz	Lauren
O'Brien	Michael & Arline
Olmsted	Coert
Oram	Valarie
Orihuela	Jeannete
Orr	Katherine
Ota	John & Ruth
Pa	Leland
Palma-Glennie	Janice

Individuals	
First	**Last**
Paoa	Robert
Papa	Richard
Parrish	Frank
Parry	James
Perchan	Mark and Leilani
Perry	Carol
Philpott	Margaret
Pool	Elayne
Porter	Carol
Price	Megan
Proctor	Kelly
Protheroe	Mary
Pyuen	Kyle
Quick	Susan
Quitevis	Leimaile
Reed	Bob
Reiziss	Jean
Reiziss	Stann
Ritte	Walter
Roberts	Jerry & Sherry
Roche	Kim
Rosner	Sonia
Rossoff	Leonard
Russell	Susan and Charles
Ryan	Joe

Individuals	
First	**Last**
Salmon	Christopher
Sager	Bill
Sasada	Jana
Sena	Phyllis
Shima	Jan
Shirai	Thomas
Shulman	Corinne
Simmons	Robert & Winifred
Simonsma	Bill
Slaven	Ronnie
Snyder	Robert
Souzi	Kehaulani
Stephenson	John
Sterne	Bob
Sullivan	Donna
Sumner-Mack	Robert
Tallman	Hap
Tam	Ryan
Terayama	Ryan
Teves	Glenn
Thompson	Kimbal
Tillotson	Cliff
Titcomb	Robert
Toledo	Rick
Tomasa	Claudine

Individuals	
First	**Last**
Tomey	Kim
Tucker	Brian
Tuggle	Dave
Turner	James
Tyler, III	Curtis
Uwins	James
Uyeoka	Kelley
Valdez	Chanel
Valencia	Mark
Valenti	Pat
Van Lier Ribbink	Peter
Vericker	Bob
Villarimo	Poola
Vitousek	Mike
Wai	Leandra
Wasson	Harry
Werjefelt	Bertil
Werjefelt	Christian
Westfall	Angie
Whelden	Craig

Individuals	
First	**Last**
Wida	Erich
Wiecking	Ken and Donna
Willie	Margaret
Wolf	William
Wolfgramm	Maka
Wong	Scott
Wright	Tom
Wulzen	Renee
Yamada	Karen
Yamanoha	Tammy
Young	John
Wall	Kaua
(N/A)	Alexandra
(N/A)	Judy
(N/A)	Malia
(N/A)	Meredith
(N/A)	Peter

1 ## 10.2.4 PUBLIC LIBRARIES

Public Libraries
Island of Hawaii: Hilo, Kea'au, Kailua-Kona, North Kohala (Kapaau), Laupahoehoe, Thelma Parker Memorial Public and School (Kamuela), Waimea, UH-Hilo
Island of Kauai: Lihue, Waimea, Kauai Community College
Island of Maui: Kahului, Kihei, Wailuku, Maui Community College
Island of Molokai: Molokai (Kaunakakai), Molokai High School
Island of Oahu: Hawaii State Library, Honolulu Municipal, Kahuku, Kailua, Kaneohe, Mililani, Wahiawa, Waialua, Waianae, Waimanalo, Windward Community College, UH Manoa – Hamilton Library

10.2.5 NEWS AND MEDIA

News and Media
Aloha Aina Ea Ea Newspaper
Big Island Weekly
Garden Isle Newspaper
Hawaii Tribune Herald
Honolulu Star Advertiser

News and Media
The Maui News
Molokai Dispatch
West Hawaii Today
KOSC