NEPA Action EA/EIS
Publication Form

Project Name: Marine Corps Base (MCB) Hawaii Ground Forces Modernization -- Draft Environmental Assessment (EA)

Island: O'ahu
District:
TMK:
Permits: National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System (MS4) permit.
Applicant or Proposing Agency: Marine Corps Forces, Pacific (MARFORPAC)
Maj Travis McWhirter, (808) 477-8434, travis.mcwhirter@usmc.mil
Approving Agency: Naval Facilities Engineering Command, Pacific
John Bigay, (808) 472-1196, Bigay, john.c.bigay.civ@us.navy.mil

Consultant: Stantec; 737 Bishop Street, Suite 3050, Honolulu HI 96813
Peer Amble, (805) 570-1313, peer.amble@cardno-gs.com

Status: A printed copy is available at the Hawaii Documents Center (Hawaii State Public Library) and at the following libraries on O'ahu: ʻEwa Beach Public Library, Hawaiʻi Kai Public Library, Kahuku Public & School Library, Kailua Public Library, Kaneohe Public Library, Kapolei Public Library, Mililani Public Library, Waialua Public Library, Waiʻanae Public Library, and Waimānalo Library. A copy of the Draft EA and Section 106 consultation correspondence is located at the following websites: https://planning.hawaii.gov/erp and the MCB Hawaii website: https://www.mcbhawaii.marines.mil/Resources-Services/Pertinent-Information/Ground-Forces-Modernization-EA. The Draft EA will be available for a thirty-day public review and comment; all comments must be in writing and postmarked or emailed on or before January 25, 2024. Please address written comments to: Peer Amble, Stantec GS Inc., 737 Bishop Street, Suite 3050, Honolulu HI, 96813. Comments may also be submitted via email to: MCBH-EA@stantecgs.com.

Summary: The proposed action is the modernization of equipment, infrastructure, and training for Marine Corps ground forces in Hawai‘i. The proposed equipment changes are evolutions of existing equipment and combat capabilities and have operational characteristics similar to those historically used by Marine Corps ground forces in Hawai‘i. These modernized ground forces would continue to conduct activities within the footprint of MCB Hawaii and training ranges in Hawai‘i. The training portions of the proposed action would occur at MCB Hawaii Kaneohe Bay, Marine Corps Training Area Bellows, and Pu‘uloa Range Training Facility. The construction portion of the proposed action would occur at MCB Hawaii Kaneohe Bay.

Revised February 2012

Draft
ENVIRONMENTAL ASSESSMENT

for

GROUND FORCES MODERNIZATION

MARINE CORPS BASE HAWAII

O‘AHU, HAWAI‘I

December 2023

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Abstract

Designation:	**Environmental Assessment**
Title of Proposed Action:	**Ground Forces Modernization**
Project Location:	**Marine Corps Base (MCB) Hawaii, Oʻahu, Hawaiʻi**
Affected Region:	**City and County of Honolulu, Oʻahu, Hawaiʻi**
Action Proponent:	**Marine Corps Forces, Pacific (MARFORPAC)**
Point of Contact:	Maj Travis McWhirter, MARFORPAC Email comments to: MCBH-EA@stantecgs.com or Mail comments to: Peer Amble Stantec GS Inc. 737 Bishop Street, Suite 3050 Honolulu HI, 96813
Date:	**December 2023**

The Marine Corps has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality and Department of the Navy regulations, and Marine Corps Order 5090.2. The proposed action is the modernization of equipment, infrastructure, and training for Marine Corps ground forces in Hawaiʻi. The proposed action would occur at Marine Corps Base (MCB) Hawaii and associated training ranges in Hawaiʻi.

This EA evaluates the potential environmental impacts of the proposed action to the following resources: noise, air quality, water resources, cultural resources, biological resources, public health and safety, and transportation.

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Summary

S.1 Proposed Action

The 2022 National Defense Strategy, the 2022 Indo-Pacific Strategy of the United States (U.S.), Secretary of Defense 2023 Planning Guidance, and the Commandant of the Marine Corps 2019 Planning Guidance redirected the U.S. Marine Corps' mission from sustained operations ashore to great-power and peer-level competition, with special emphasis on the Pacific. This shift in mission, along with technological advancements in equipment sets, requires adjustments in how the Marine Corps organizes, trains, and equips its force. As part of this restructuring, Marine Corps ground forces assigned to Marine Corps Base (MCB) Hawaii require additional capabilities and equipment to support emerging joint, naval, and Marine Corps operating concepts.

The proposed action is the modernization of equipment, infrastructure, and training for Marine Corps ground forces in Hawai'i. The proposed equipment changes are evolutions of existing equipment and combat capabilities and have operational characteristics similar to those historically used by Marine Corps ground forces in Hawai'i. The facility construction and equipment modernization portions of the proposed action would be implemented over an 8-year period from Fiscal Year (FY) 2024 through FY 2031. These modernized ground forces would continue to conduct activities within the footprint of MCB Hawaii and training ranges in Hawai'i. The training portions of the proposed action would occur at MCB Hawaii Kaneohe Bay, Marine Corps Training Area Bellows (MCTAB), and Pu'uloa Range Training Facility (Pu'uloa RTF) (Figure S-1). The construction portion of the proposed action would occur at MCB Hawaii Kaneohe Bay (Figures S-2 and S-3).

S.2 Purpose of and Need for the Proposed Action

The purpose of the proposed action is to modernize existing Marine Corps ground forces in Hawai'i. The need for the proposed action is to enhance the combat capability of Marine Corps ground forces in Hawai'i, enabling them to meet U.S. Marine Corps responsibilities set forth in Title 10 United States Code (U.S.C.) Section 8063 in support of the U.S. Indo-Pacific Command (USINDOPACOM).

S.3 Alternatives Considered

The Marine Corps considered and eliminated two training alternatives from detailed analysis because they did not meet the purpose and need for the proposed action: Solely Virtual Training and Training Outside Hawai'i. The equipment and training for the proposed action is necessary to support the emerging joint, naval, and Marine Corps operating concepts. As such, there is no alternative equipment or required training for that equipment that would enable Marine Corps ground forces in Hawai'i to meet the purpose and need. Therefore, the alternatives analysis focuses on facilities and on training tempo.

The Marine Corps considered all reasonable alternatives to support the facilities requirements. Reuse and renovation of existing facilities was initially considered for a number of reasons to include historic resource preservation, avoidance of sensitive archaeological resources, and avoidance and/or minimization of potential biological resource effects. In developing facilities alternatives, the Marine Corps sought to maximize reuse and renovation of existing facilities and minimize the need for new construction.

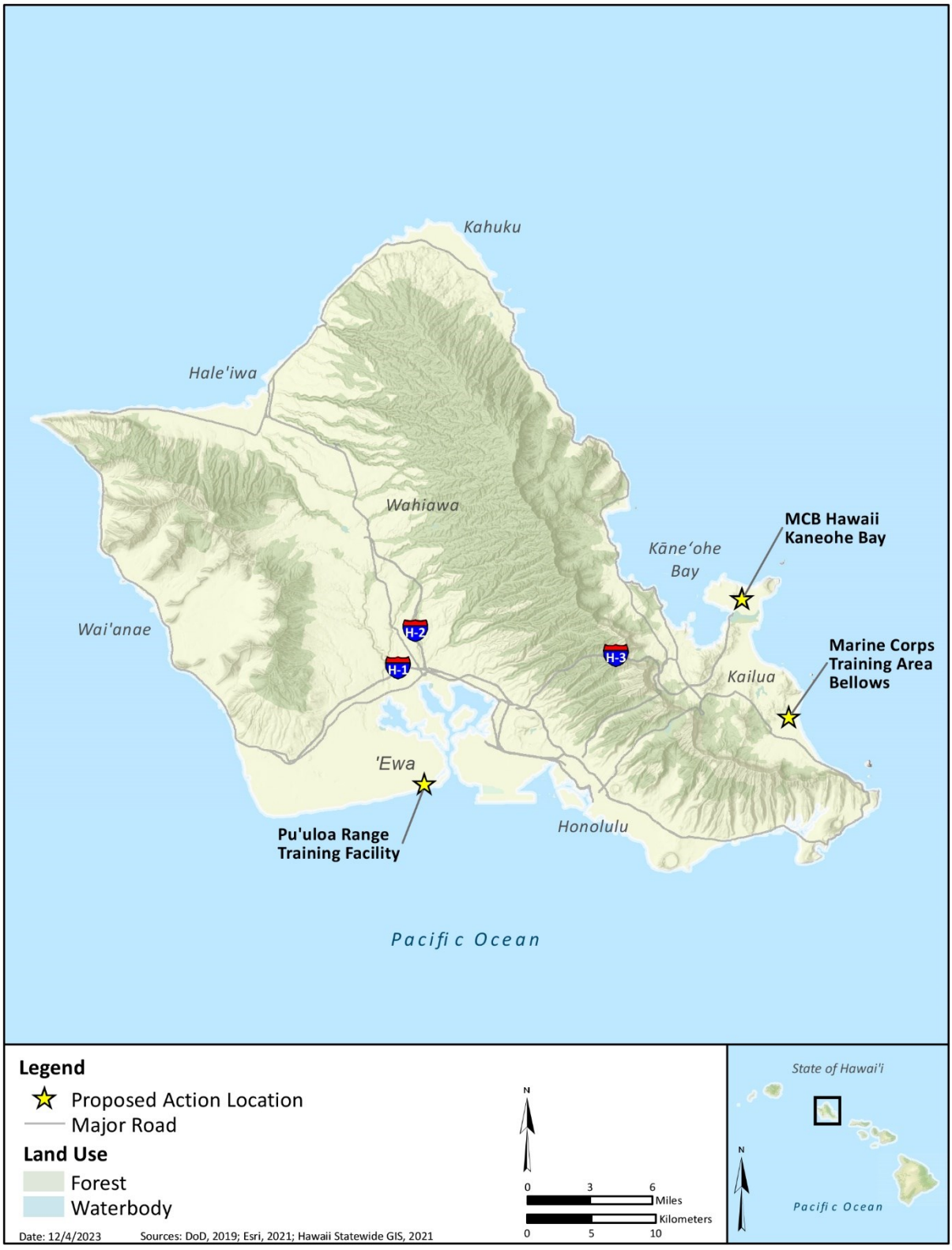

Figure S-1 MCB Hawaii Landholdings

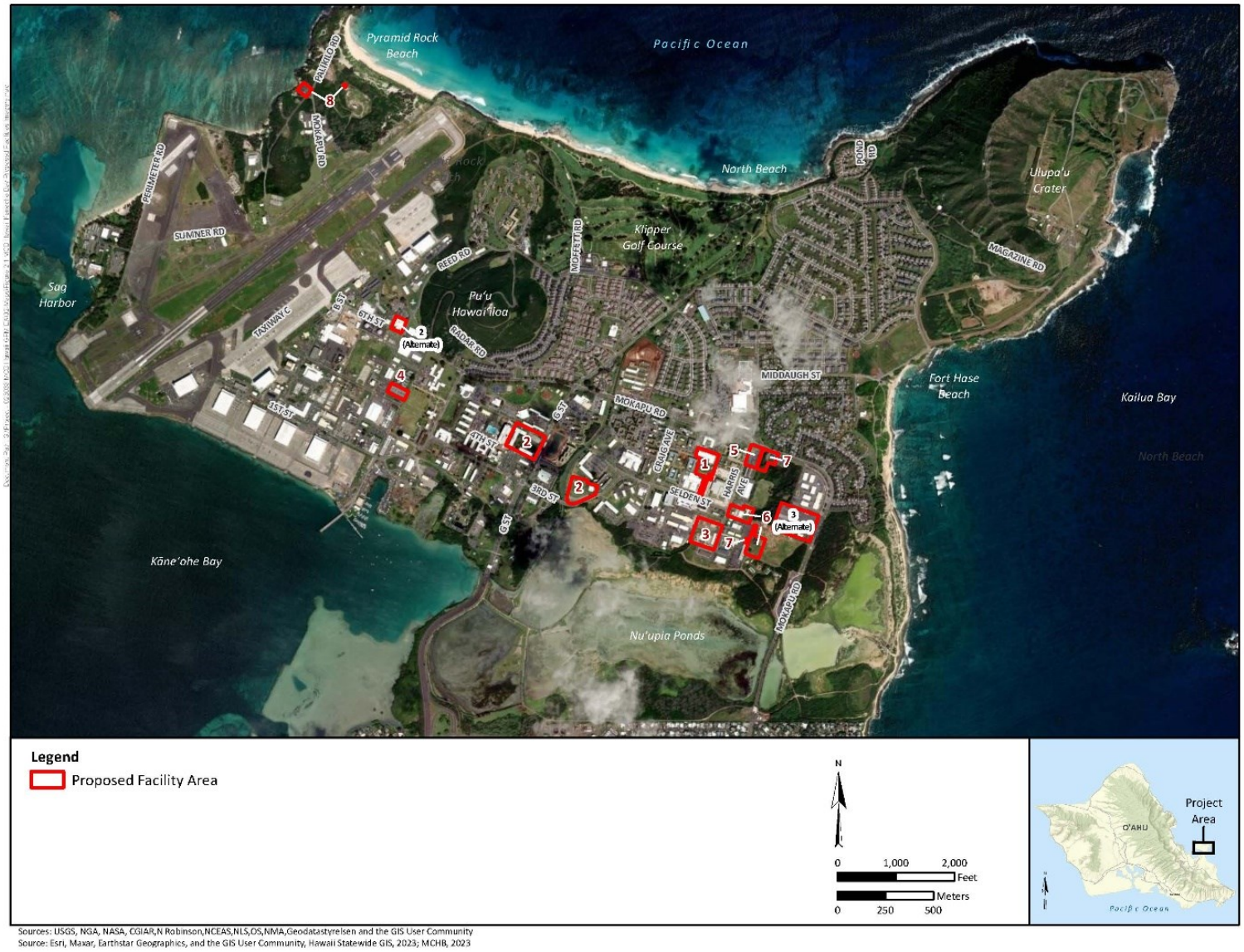

Figure S-2 Proposed Facilities Preferred Locations, MCB Hawaii Kaneohe Bay

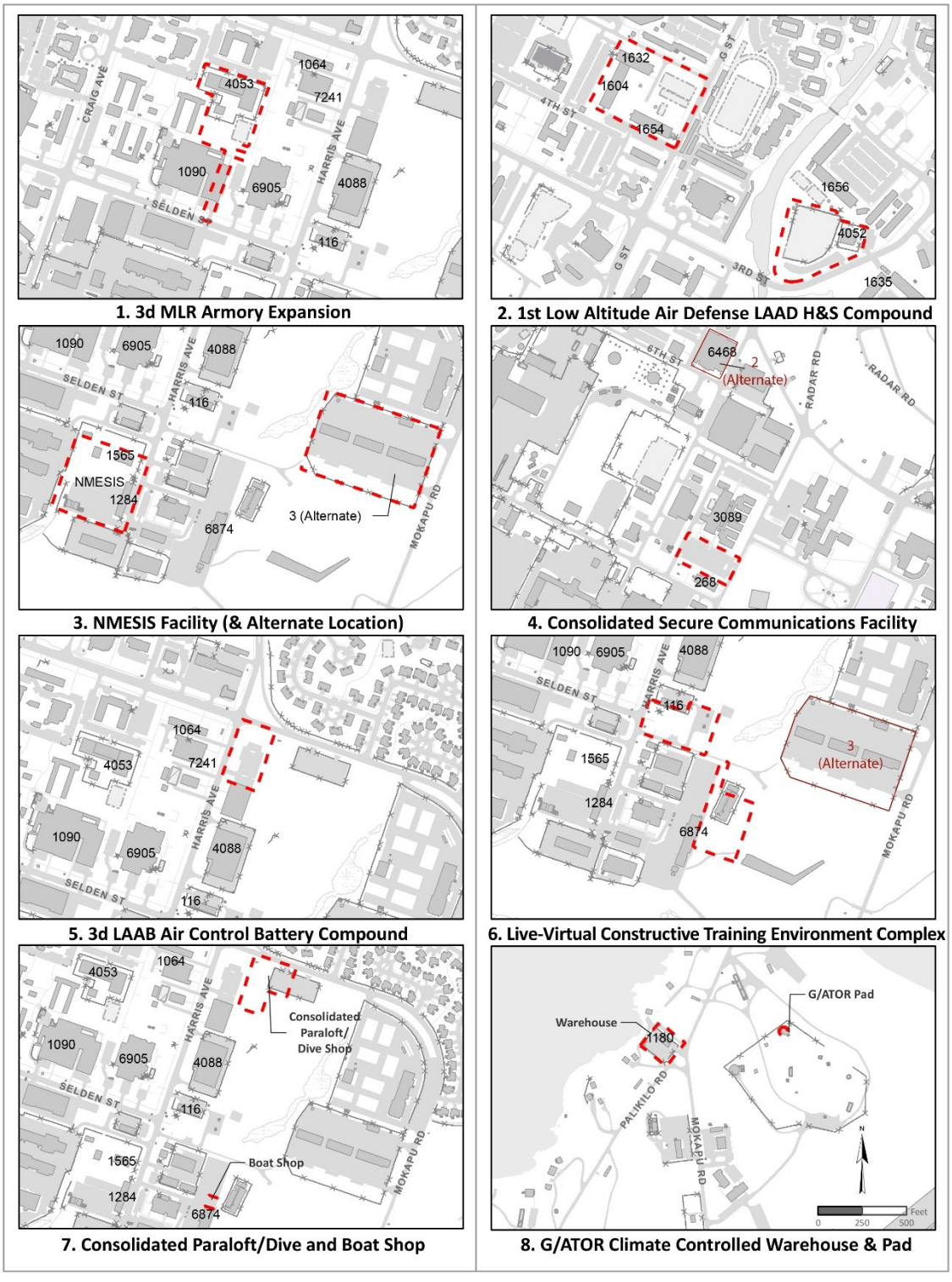

Figure S-3 Proposed Facilities Project Footprints

Alternative 1 training would include modernized equipment of the same type, in the same places, and at the same tempo as existing training. Alternative 2 training is identical to Alternative 1, but training tempo would increase by approximately 20 percent (%) over baseline levels. This increase to baseline would accommodate an increase in training attributable to transiting forces and Marine Corps ground forces in Hawai'i. The preferred alternative for facilities modernization to support the training would consist of a combination of renovation, demolition and construction. None of the construction would affect historic resources nor have a significant environmental impact. Alternatives to the facilities laydowns emphasize renovation over construction but come at considerable expense to the mission with no appreciable difference in impacts. Facilities alternatives are independent of the alternative levels of training activity with the modernized equipment.

S.4 Summary of Potential Environmental Consequences of the Alternatives and Major Mitigating Actions

Table S-1 presents a summary of potential environmental impacts associated with the proposed action.

S.5 Public and Agency Participation and Intergovernmental Coordination

The Marine Corps is soliciting public and agency input regarding the proposed action through publication of a Draft EA and through the National Historic Preservation Act (NHPA) Section 106 consultation process. The Marine Corps published a notice of availability for review of the Draft EA in the *Honolulu Star-Advertiser* on December 26, 2023. The public has 30 days to comment on the EA as well as the Section 106 finding of no effect. Prior to the release of the Draft EA, MCB Hawaii Public Affairs Officers coordinated with the local community at monthly Neighborhood Board meetings and other public engagement opportunities about the proposed action and the associated Draft EA public comment period. The Draft EA is available on the State of Hawai'i's Environmental Review Program website: https://planning.hawaii.gov/erp/ and the MCB Hawaii website: https://www.mcbhawaii.marines.mil/Resources-Services/Pertinent-Information/Ground-Forces-Modernization-EA.

In accordance with Section 106 of the NHPA, the Marine Corps is consulting with the Hawai'i State Historic Preservation Division (SHPD), Native Hawaiian Organizations, interested parties, and the public regarding a finding of no adverse effect to historic properties resulting from the proposed action. The Marine Corps initiated Section 106 consultation with the SHPD for the undertaking in September 2023.

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA), the Marine Corps is conducting informal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding potential impacts to ESA-listed species. The USFWS is reviewing the Marine Corps determination that the preferred facilities construction component and Alternative 1 training would have no effect or may affect, but is not likely to adversely affect, ESA-listed species at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF.

The proposed action falls under the Marine Corps' Coastal Zone Management Act (CZMA) De Minimis Activities List (State of Hawai'i CZMA letter, 9 July 2009). The Marine Corps notified the State of Hawai'i Office of Planning and Sustainable Development, Planning Division, regarding its determination on November 29, 2023.

Table S-1 Summary of Potential Impacts

Resources	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Noise	• Less than significant impacts. • Construction would be localized, temporary, and limited to daytime hours. • Noise levels generated from modernized equipment would be the same or slightly less than legacy equipment.	• Noise levels generated from modernized equipment would be the same or slightly less than legacy equipment. • Construction for alternate facilities would have less noise than for preferred facilities due to less overall construction. • The slight increase in training would not be noticeable to community members in the area.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to the noise environment.
Air Quality	• Less than significant impacts. • Construction and training activities would only minimally increase emissions and would not substantially contribute to global warming.	• Construction emissions for alternate facilities would be less than for preferred facilities. • Training activities would only minimally increase emissions and would not substantially contribute to global warming.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to air quality.
Water Resources	• Less than significant impacts to groundwater, surface water, wetlands, and floodplains. • The proposed action would follow the USEPA NPDES Construction General Permit. • The proposed action would follow a site-specific SWPPP, conservation measures, and stormwater runoff protection measures. • Training would be similar to the type and tempo for current training activities and would occur in the same locations. • The Marine Corps would continue to comply with MCB Hawaii Order 1500.9C procedures.	• Alternate facilities would be less than preferred facilities due to a reduced construction footprint. • For training, the increased activity increases the potential for water resource effects, but the potential effects would be managed just as it is currently done for ground-based training at these locations. • The Marine Corps would continue to comply with MCB Hawaii Order 1500.9C procedures.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to water resources.

Resources	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Cultural Resources	• Less than significant impacts to archaeological resources. Impacts to archaeological sites would be minimized through archaeological monitoring. • Less than significant impacts to historic resources. • Training would be similar to the type and tempo for current training activities and would occur in the same locations. • The Marine Corps would continue to comply with MCB Hawaii Order 1500.9C procedures.	• Alternate facilities construction would occur at fewer locations than preferred facilities construction. • Identical monitoring procedures would be implemented. • Because adverse effects to cultural resources would be avoided, the increased tempo of Alternative 2 training would not result in additional risk of impacts.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to cultural resources.
Terrestrial Biological Resources	• Less than significant impacts to vegetation, wildlife, critical habitat, and ESA-listed species. • Training activities would continue to adhere to procedures established in MCB Hawaii Order 1500.9C to reduce potential impacts to terrestrial biological resources. • The preferred alternative either may affect, but is not likely to adversely affect, ESA-listed species or has no effect on other ESA-listed species.	• Alternate facilities construction impacts would be similar to Alternative 1 but reduced due to the smaller disturbance area. • Increased training represents a relatively small change when considered on a daily and weekly basis and would not change impacts to terrestrial biological resources. • Training activities would continue to adhere to procedures established in MCB Hawaii Order 1500.9C to reduce potential impacts to terrestrial biological resources.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impacts to terrestrial biological resources.

Resources	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Public Health and Safety	• Less than significant impacts. • There would be no public access to the construction areas. Construction zones would be physically secured. • The Marine Corps would continue to follow existing training protocols to ensure safety. • The Marine Corps would continue to adhere to MCB Hawaii Order 3060.1 regarding convoy transportation safety. • Radar systems would be identical to current radar use.	• The safety elements for alternate facilities construction component would be applicable to preferred construction. • The increased training would represent an average of less than one additional vehicle convoy per week on roadways to MCTAB or Pu'uloa RTF. • The increase in training tempo would be conducted in accordance with existing procedures.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to public health and safety.
Transportation	• Less than significant impacts. • Construction traffic would be considerably less than 1% of average daily traffic volume on H-3 and have no effect on H-3 traffic. • Training traffic would represent less than 1% of the AADT on local roads and highways. • Training traffic would not affect bus routes or bikeways.	• Impacts from alternate facilities construction would be less than preferred facilities construction. • Increased training traffic would represent less than 1% of the AADT on local roads and highways. • Increased training traffic would not affect bus routes or bikeways.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to transportation.

Legend: % = percent; AADT = Annual Average Daily Traffic; ESA = Endangered Species Act; MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; NPDES = National Pollutant Discharge Elimination System; RTF = Range Training Facility; SWPPP = Stormwater Pollution Prevention Plan; USEPA = United States Environmental Protection Agency.

Environmental Assessment
Ground Forces Modernization
Marine Corps Base Hawaii

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Abbreviations and Acronyms

Item	Definition
%	Percent
AADT	Annual Average Daily Traffic
AAV	Amphibious Assault Vehicle
AFCEC	Air Force Civil Engineer Center
APE	Area of Potential Effects
BASH	Bird/Wildlife Aircraft Strike Hazard
BMP	Best Management Practice
C-UAS	Counter-Unmanned Aircraft System
CAAT	Combined Anti-Armor Team
CEG	Communications Equipment Group
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRMZ	Cultural Resource Management Zone
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibel
dBA	A-weighted Decibel
DNL	Day-Night Average Sound Level
DoD	United States Department of Defense
DOH	Hawai‘i State Department of Health
EA	Environmental Assessment
EABO	Expeditionary Advanced Base Operations
ECPD	Environmental Compliance and Protection Division
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FY	Fiscal Year
G/ATOR	Ground/Air Task-Oriented Radar
GBAD	Ground Based Air Defense
GHG	Greenhouse Gas
H&S	Headquarters and Service
HAR	Hawai‘i Administrative Rule
HDOT	Hawai‘i Department of Transportation
HMMWV	High Mobility Multi-Wheeled Vehicle
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
JLTV	Joint Light Tactical Vehicle
L-MADIS	Light Marine Air Defense Integrated System
LAAB	Littoral Anti-Air Battalion
LAAD	Littoral Anti-Air Detachment
LID	Low Impact Development
LOS	Level of Service
LZ	Landing Zone
MADIS	Marine Air Defense Integrated System
Marine Corps	United States Marine Corps
MBA	Mōkapu Burial Area
MBTA	Migratory Bird Treaty Act
MCB	Marine Corps Base
MCTAB	Marine Corps Training Area Bellows
MLR	Marine Littoral Regiment
mm	millimeter
MOUT	Military Operations on Urbanized Terrain
MS4	Municipal Separate Storm Sewer System
MTVR	Medium Tactical Vehicle Replacement

Item	Definition
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Systems Command
Navy	United States Department of the Navy
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLU	Naval Strike Missile Launcher Unit
NMESIS	Navy-Marine Expeditionary Ship Interdiction System
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSM	Naval Strike Missile
PEG	Power Equipment Group
$PM_{2.5}$	Particulate Matter Less Than or Equal to 2.5 Micrometers in Diameter
PM_{10}	Particulate Matter Less Than or Equal to 10 Micrometers in Diameter
REG	Radar Equipment Group
RIMPAC	Rim of the Pacific
ROGUE	Remote Operated Ground Unmanned Expeditionary
RTA	Range and Training Area
RTF	Range Training Facility
SHPD	Hawai‘i State Historic Preservation Division
SIF	Stand-in Force
SIHP	Hawai‘i State Inventory of Historic Places
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SWPPP	Storm Water Pollution Prevention Plan
U.S.	United States
UAS	Unmanned Aircraft System
ULTV	Ultralight Tactical Vehicle
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USINDOPACOM	United States Indo-Pacific Command
UTV	Utility Task Vehicle
VOC	Volatile Organic Compound
WWII	World War II

1 Purpose of and Need for the Proposed Action

1.1 Introduction

The 2022 National Defense Strategy, the 2022 Indo-Pacific Strategy of the United States (U.S.), Secretary of Defense 2023 Planning Guidance, and the Commandant of the Marine Corps 2019 Planning Guidance redirected the U.S. Marine Corps' mission from sustained operations ashore to great-power and peer-level competition, with special emphasis on the Pacific. This shift in mission, along with technological advancements in equipment sets, requires adjustments in how the Marine Corps organizes, trains, and equips its force.

As part of this restructuring, Marine Corps ground forces assigned to Marine Corps Base (MCB) Hawaii require additional capabilities and equipment to support emerging joint, naval, and Marine Corps operating concepts. The proposed action is the modernization of equipment, infrastructure, and training for Marine Corps ground forces in Hawai'i. The proposed equipment changes are evolutions of existing equipment and combat capabilities and have operational characteristics similar to those historically used by Marine Corps ground forces in Hawai'i. The facility construction and equipment modernization portions of the proposed action would be implemented over an 8-year period from Fiscal Year (FY) 2024 through FY 2031. These modernized ground forces would continue to conduct activities within the footprint of MCB Hawaii and training ranges in Hawai'i.

> The U.S. Marine Corps "must pursue transformational capabilities that will provide naval fleets and joint force commanders with a competitive advantage in the gray zone and during contingency."
>
> "[M]odest and incremental improvements to our existing force structure and legacy capabilities would be insufficient to overcome evolving threat capabilities."
>
> Commandant of the Marine Corps David H. Berger, March 2020

Pursuant to Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508) implementing the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C. §§ 4321, et seq.), the Fiscal Responsibility Act of 2023 (Public Law 118-5, June 3, 2023), U.S. Department of the Navy (Navy) Regulations (32 CFR Part 775), and Marine Corps Order 5090.2, the Marine Corps is preparing this Environmental Assessment (EA) to address the environmental impacts of the proposed action.

1.2 Location

The proposed action would occur at MCB Hawaii Kaneohe Bay and associated Marine Corps training areas on O'ahu (Figures 1-1 to 1-5); Army training areas are shown in Figure 1-6. While training activities would also occur on non-Marine Corps controlled ranges on O'ahu and elsewhere, as well as during coordinated Department of Defense (DoD) and joint exercises, such training activity is not analyzed in this action as explained in Section 2.1.3.

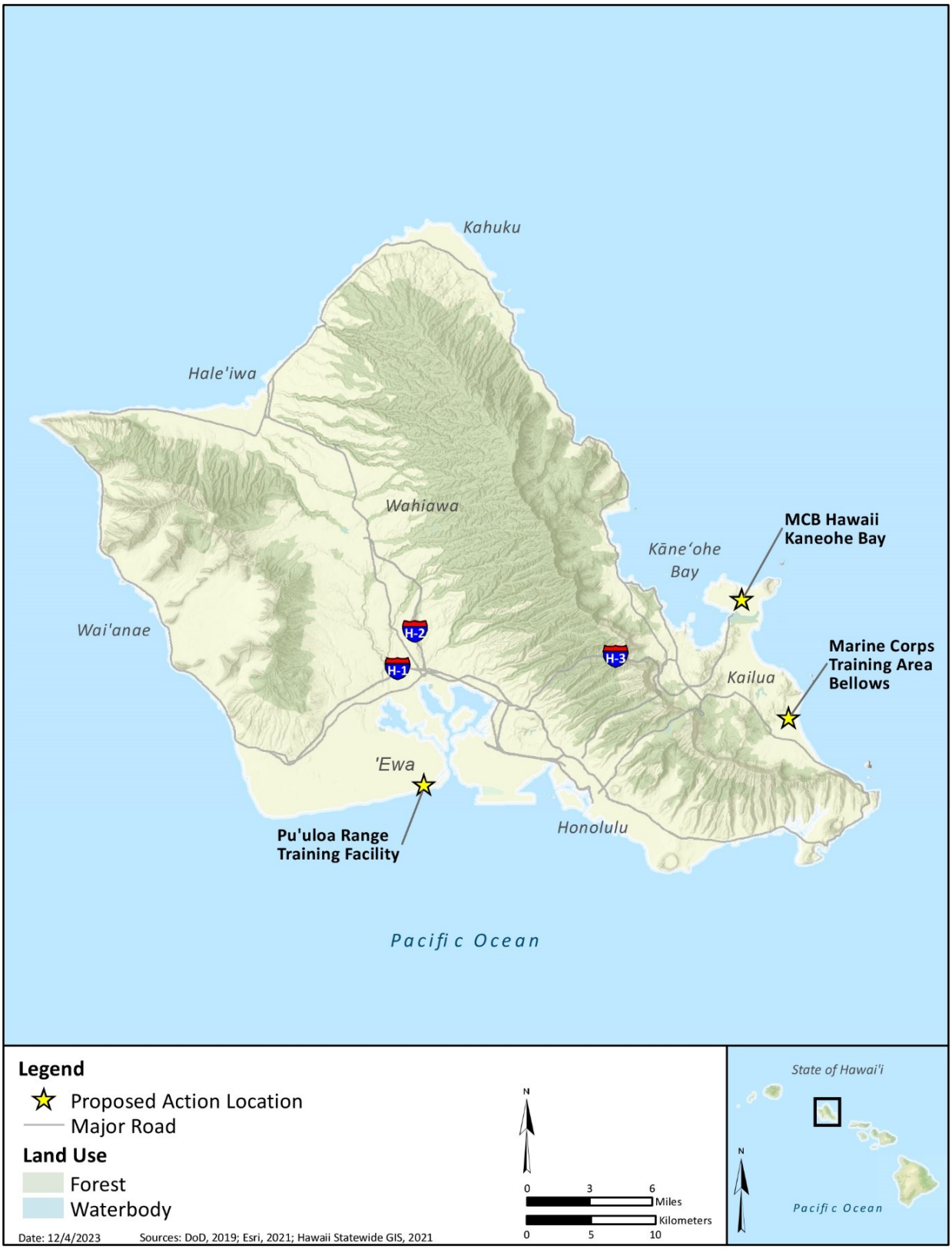

Figure 1-1 MCB Hawaii Landholdings

Figure 1-2 MCB Hawaii Kaneohe Bay

Figure 1-3 MCB Hawaii Kaneohe Bay Training Areas at Ulupaʻu Crater RTF

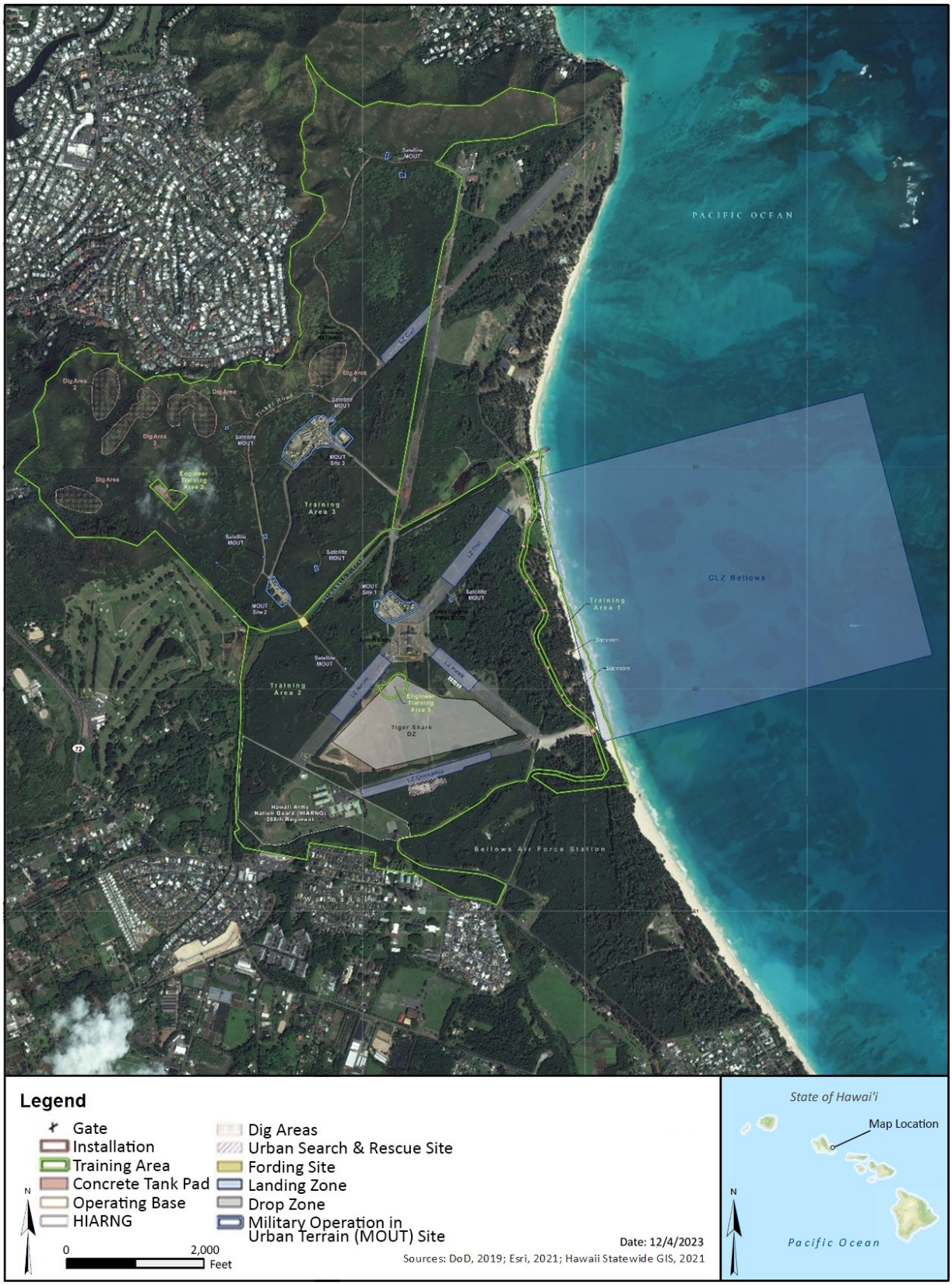

Figure 1-4 MCB Hawaii, MCTAB

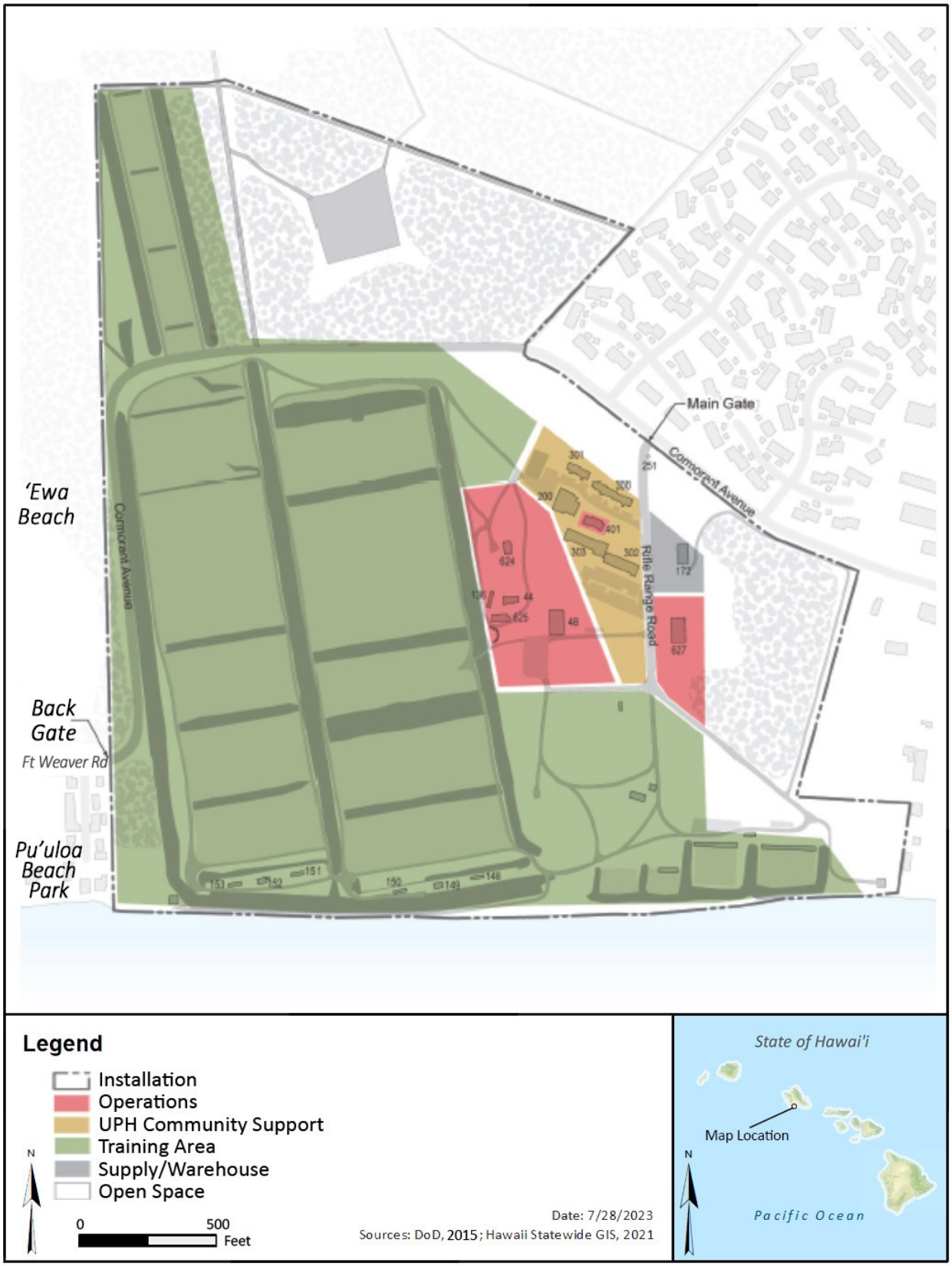

Figure 1-5 MCB Hawaii, Pu'uloa RTF

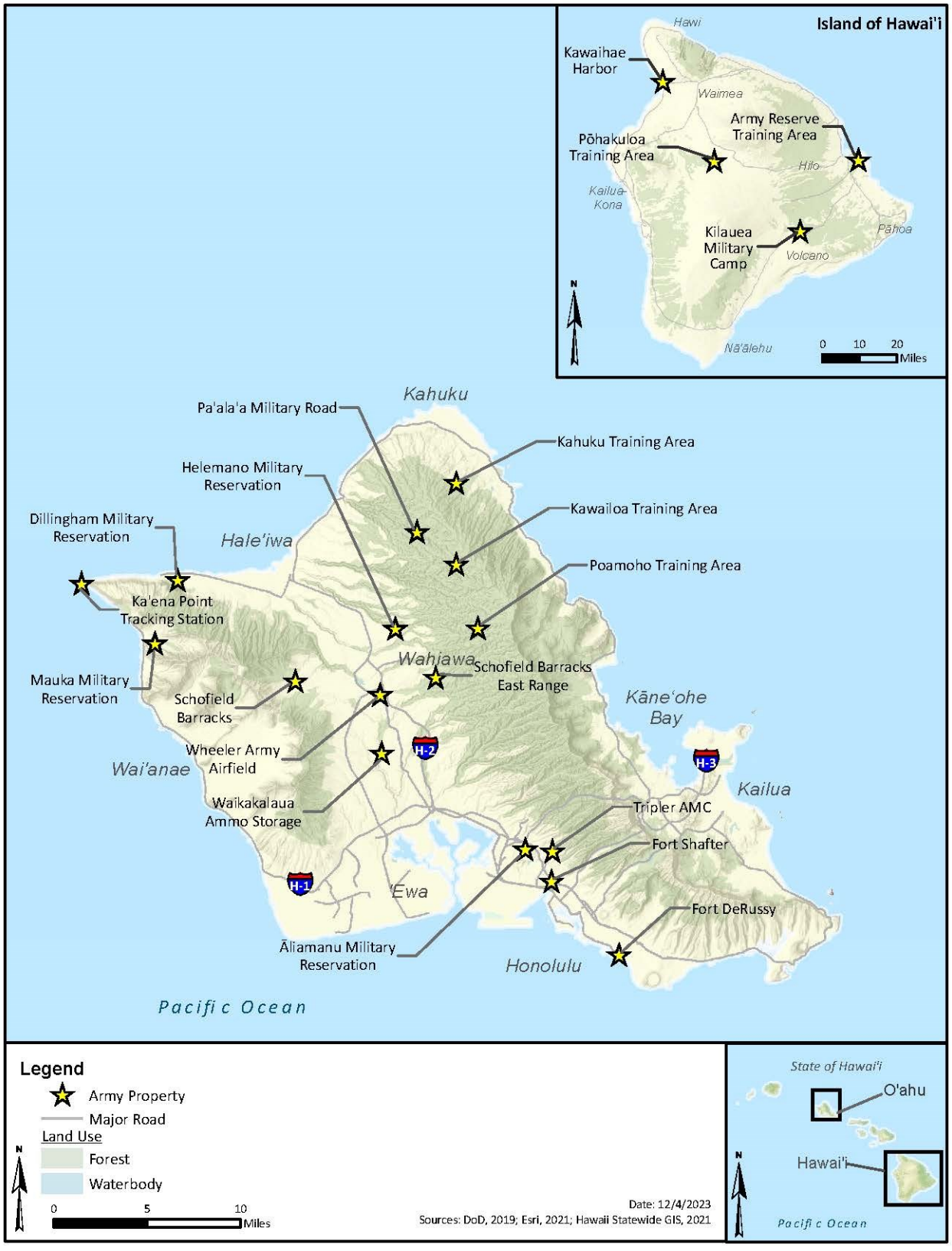

Figure 1-6 Army Training Areas in Hawai'i

1.3 Purpose of and Need for the Proposed Action

The purpose of the proposed action is to modernize existing Marine Corps ground forces in Hawai‘i. The need for the proposed action is to enhance the combat capability of Marine Corps ground forces in Hawai‘i, enabling them to meet U.S. Marine Corps responsibilities set forth in Title 10 U.S.C. Section 8063 in support of the U.S. Indo-Pacific Command (USINDOPACOM).

1.4 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with the proposed action. The process for identifying resources analyzed in this EA is summarized in Chapter 3, *Introduction*. The environmental resources analyzed in detail include:

- Noise
- Air Quality
- Water Resources
- Cultural Resources
- Terrestrial Biological Resources
- Public Health and Safety
- Transportation

1.5 Relevant Laws and Regulations

The Marine Corps has prepared this EA based upon federal and state laws, statutes, regulations, and policies pertinent to the implementation of the proposed action (Appendix A).

1.6 Public and Agency Participation and Intergovernmental Coordination

The Marine Corps is soliciting public and agency input regarding the proposed action through publication of a Draft EA and through the National Historic Preservation Act (NHPA) Section 106 consultation process. The Marine Corps published a notice of availability for review of the Draft EA in the *Honolulu Star-Advertiser* on December 26, 2023. The public has 30 days to comment on the EA as well as the Section 106 finding of no adverse effect. Prior to the release of the Draft EA, MCB Hawaii Public Affairs Officers coordinated with the local community at monthly Neighborhood Board meetings and other public engagement opportunities about the proposed action and the associated Draft EA public comment period. The Draft EA is available on the State of Hawai‘i’s Environmental Review Program website: https://planning.hawaii.gov/erp and the MCB Hawaii website: https://www.mcbhawaii.marines.mil/Resources-Services/Pertinent-Information/Ground-Forces-Modernization-EA.

Public comments on the Draft EA will be considered in the development of the Final EA prior to the Marine Corps rendering a decision on the proposed action. A detailed summary of public comments, revisions made to the EA in response to comments, and responses to comments will be provided in Appendix B of the Final EA.

In accordance with Section 106 of the NHPA, the Marine Corps is consulting with the Hawai‘i State Historic Preservation Division (SHPD), Native Hawaiian Organizations, interested parties, and the public

regarding a finding of no adverse effect to historic properties resulting from the proposed action. The Marine Corps initiated Section 106 consultation with the SHPD for the undertaking in September 2023 (Appendix C).

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA), the Marine Corps is conducting informal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding potential impacts to ESA-listed species. The USFWS is reviewing the Marine Corps determination that the preferred facilities construction component and Alternative 1 training would have no effect or may affect, but is not likely to adversely affect, ESA-listed species at MCB Hawaii Kaneohe Bay, Marine Corps Training Area Bellows (MCTAB), and Pu‘uloa Range Training Facility (RTF) (Appendix D).

The proposed action falls under the Marine Corps’ Coastal Zone Management Act (CZMA) De Minimis Activities List (State of Hawai‘i CZMA letter, July 9, 2009). The Marine Corps notified the State of Hawai‘i Office of Planning and Sustainable Development, Planning Division, regarding its determination November 29, 2023 (see CZMA correspondence in Appendix E).

1.7 Permits and Approvals

Permits and approvals necessary for the proposed action include either: (a) an application for a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit, which will be processed through the Hawai‘i State Department of Health (DOH); or (b) an application for coverage under the State of Hawai‘i general permit which is required for discharges of stormwater associated with construction activities in excess of 1 acre (DOH, 2023). Construction projects and vehicle maintenance would fit within the existing MCB Hawaii Kaneohe Bay oil/water separator capacity and remain beneath the MCB Hawaii Kaneohe Bay solid waste management and hazardous waste management plan capacity thresholds. The Marine Corps will coordinate with the State of Hawai‘i and U.S. Environmental Protection Agency (USEPA) to determine if other permits are necessary.

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2 Proposed Action and Alternatives

This chapter describes the proposed action, alternatives development (including alternatives considered but not carried forward for analysis), Alternatives 1 and 2, the No-Action Alternative, and best management practices (BMPs) incorporated into the proposed action to avoid or reduce environmental impacts.

2.1 Proposed Action

The proposed action is the modernization of equipment, infrastructure, and training for Marine Corps ground forces in Hawai'i. The proposed action would occur at MCB Hawaii Kaneohe Bay and associated training ranges in Hawai'i. The proposed action has three components: (1) modernize equipment (Section 2.1.1); (2) upgrade, renovate, and construct support facilities (Section 2.1.2); and (3) conduct training activities with the modernized equipment (Section 2.1.3). There would be no change in the number of Marine Corps ground forces in Hawai'i because of the proposed action.

2.1.1 Equipment

The proposed action would involve modernization of equipment used by Marine Corps ground forces in Hawai'i. This includes vehicles and weapons systems with greater mobility designed for modern expeditionary warfare. The proposed equipment changes are evolutions of existing equipment and combat capabilities with operational characteristics similar to those historically used by Marine Corps ground forces in Hawai'i. The modernized equipment would be stored and maintained at MCB Hawaii Kaneohe Bay. The proposed action would not result in an increase in net explosive ordnance stored at MCB Hawaii Kaneohe Bay. For training events, the equipment and personnel would transit over base and public roadways (depending on the Range and Training Area [RTA]) from MCB Hawaii Kaneohe Bay to the training area and then back to MCB Hawaii Kaneohe Bay). This would facilitate Marine Corps training consistent with Stand-in Force (SIF) and Expeditionary Advanced Base Operations (EABO) concepts (see conceptual illustration below).

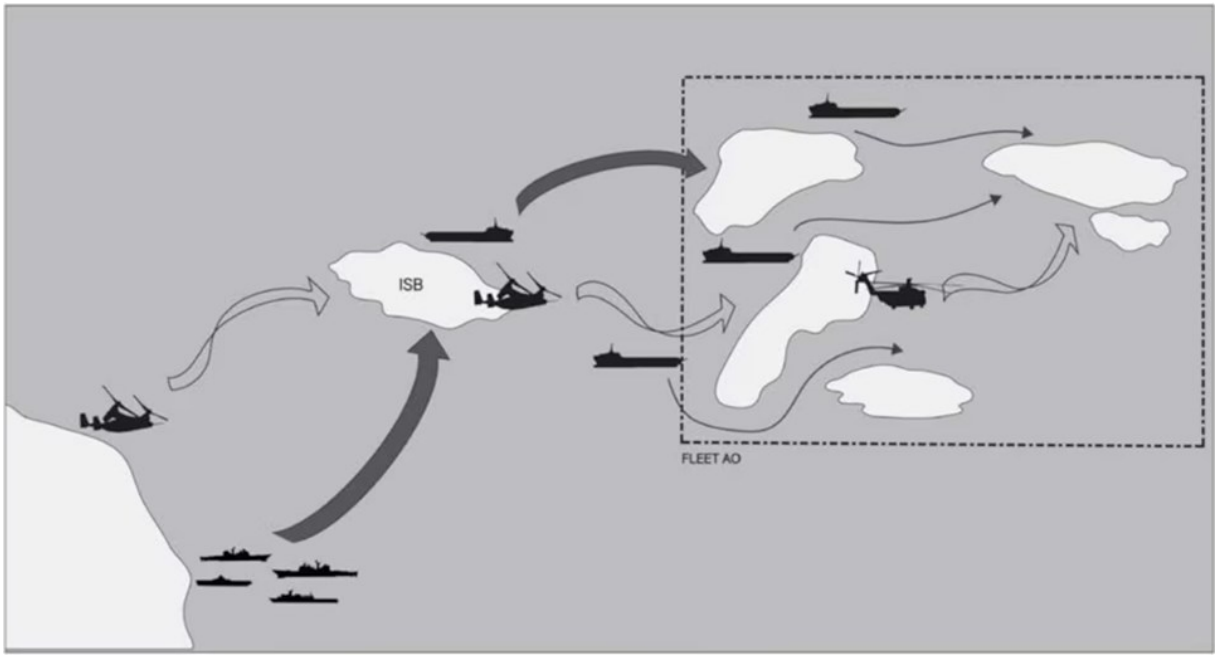

Illustration 1: Expeditionary Advanced Base Operations Concept

The SIF is composed of small, low signature (i.e., difficult to detect), mobile forces. One of the characteristics of a SIF is the ability to conduct EABO operations, which consist of the employment of small, low signature, persistent, and relatively easy to maintain and sustain naval expeditionary forces from temporary locations.

This section includes an overview, equipment summary, and training summary for each equipment modernization type. A more detailed description of training events with the modernized equipment is provided in Section 2.1.3.

2.1.1.1 Navy-Marine Expeditionary Ship Interdiction System (NMESIS)

- Overview. The NMESIS (Photos 1 and 2) provides the capability to fire anti-ship missiles from land. It combines the Naval Strike Missile (NSM) Launcher Unit (NLU) with the Remote Operated Ground Unmanned Expeditionary (ROGUE) Fires Carrier. The ROGUE Fires Carrier consists of a missile launcher built on top of a joint light tactical vehicle (JLTV). The JLTV family of vehicles uses a modular concept to provide mobility for personnel and payloads across the full spectrum of military operations. The JLTV is currently in use by all services on all Hawai'i military training ranges.
- Equipment. At full operational capability, NMESIS batteries aboard MCB Hawaii Kaneohe Bay would be composed of 18 launchers separated into two platoons of nine launchers each (Photo 1). The platoons are further subdivided into three sections of three launchers each. Each NMESIS section would consist of five Marines and five JLTV vehicles (Photo 2): one leader JLTV vehicle, one command and control JLTV vehicle, and three JLTV launcher vehicles. Unlike the current cannon artillery sections of approximately 14 Marines, which use two 7-ton trucks and two trailers to carry their launchers and munitions, the NMESIS launcher uses the smaller JLTVs for transportation.
- Training. As part of the Marine Corps' ground force modernization efforts, Marines would implement the EABO concepts described above utilizing small, low signature, mobile forces. Compared to cannon artillery training previously conducted on military training ranges in Hawai'i, NMESIS training would involve a smaller transportation vehicle (JLTV vs 7-ton truck), a smaller number of personnel and equipment per training cycle, a smaller footprint, and would not involve "live fire" of the weapon system on O'ahu.

Photo 1: NMESIS Launcher

Photo 2: NMESIS Section

As seen in Photo 2, the three vehicle types that make up a NMESIS section all utilize the same JLTV chassis but consist of different modules on top of the JLTV chassis.

2.1.1.2 Marine Air Defense Integrated System (MADIS) and Light MADIS (L-MADIS)

MADIS:

- Overview. The MADIS (Photo 3) represents the Marine Corps' modernization of its Ground Based Air Defense (GBAD) and Counter-Unmanned Aircraft System (C-UAS) capabilities. MADIS is a maneuverable, ground-based air defense system that provides the Marine Corps with an improved mobile, short-range air defense capability in support of expeditionary bases and maneuvering units.
- Equipment. The MADIS, like the NMESIS system, utilizes the JLTV chassis currently in use by all services on all Hawai'i military training ranges. This system is designed to detect, track, identify, and defeat aerial threats at short range (Photo 3). Two firing batteries are separated into four platoons with three systems each and a headquarters element with one system. The platoons are further subdivided into three sections with one system and eight Marines each. Each MADIS section would consist of eight Marines and four JLTV vehicles. This air defense system requires each section to operate two complementary vehicles, the MADIS Mk1 and Mk2. The MADIS Mk1 vehicle is responsible for neutralizing fixed- and rotary-wing aircraft, while the MADIS Mk2 provides command and control for both vehicles. This two-vehicle system has technology and weaponry that is similar to equipment currently used on Hawai'i ranges (i.e., Stinger missiles, the RPS-62-S band radar, and 30 millimeter [mm] direct fire weapons).
- Training. As part of the Marine Corps' ground forces modernization efforts, Marine Corps ground forces in Hawai'i would implement EABO concepts utilizing small, low signature, mobile forces. Compared to the vehicle footprint and personnel of the Infantry Battalion Weapons Company Combined Anti-Armor Teams (CAAT) previously training on O'ahu, which would employ a section comprised of four high-mobility multi-wheeled vehicles (HMMWVs) working as a complementary pair with approximately 16 Marines, MADIS training would involve a smaller number of personnel and equipment per training cycle and would not involve "live fire" of the weapon system on O'ahu.

Photo 3: MADIS

L-MADIS:

- Overview. The L-MADIS (Photo 4) is a scaled down capability set of the MADIS that offers the Marine Corps greater flexibility in employment of C-UAS operations due to its ability to operate in austere environments. It provides the Marine Corps with the capability to disrupt the command and control of enemy Unmanned Aircraft Systems (UAS); however, it lacks the ability to defeat enemy UAS with offensive capabilities.
- Equipment. The L-MADIS is mounted to an ultralight tactical vehicle (ULTV), which is similar to a commercial off-road, all-terrain vehicle. The ULTV, a modular, off-road utility vehicle, replaces the Utility Task Vehicle (UTV). The L-MADIS system uses two ULTVs working in tandem (Photo 4). One vehicle uses the RPS-62 radar (the same radar the MADIS uses) for detection and surveillance and includes an electronic attack capability to defeat UAS. Acting as a support vehicle, the second L-MADIS transmits data between vehicles and air/ground platforms. The L-MADIS' small size allows it to be transported by CH-53s and MV-22s and makes it more maneuverable than the MADIS.

  Training. Like the NMESIS and MADIS systems, the L-MADIS is part of the Marine Corps' ground forces modernization efforts utilizing EABO concepts. After being transported to the training area via aircraft or flatbed tractor trailer, personnel will practice operating the vehicle on the range by acquiring a simulated target, and virtually testing the command, control, and radar functions of the system. L-MADIS training would involve smaller numbers of personnel and equipment per training cycle than legacy equipment.

Photo 4: L-MADIS

2.1.1.3 AN/TPS 80 Ground/Air Task-Oriented Radar (G/ATOR):

- Overview. The G/ATOR (Photo 5) is a three dimensional, short/medium range, multi-role radar system that transmits in the S Band (2–4 gigahertz) frequency range – the same frequency range used daily on O'ahu. It provides surveillance of airspace to provide accurate location, altitude, direction, and identification of aircraft. The radar information can then be used to ensure the safe flight of aircraft through routing instructions. Additionally, in tactical situations, the radar provides early warning of enemy air attack or can cue other air defense units. The G/ATOR would replace five legacy systems and, depending on the "block" of software used, can support various missions such as air defense and surveillance, artillery operations, and Expeditionary Airport Surveillance Radar capability.
- Equipment. The G/ATOR consists of three subsystems (Photo 5). The first subsystem is the Radar Equipment Group (REG), which consists of the radar array towed on a trailer by a Medium Tactical Vehicle Replacement (MTVR), a vehicle commonly used by the Marine Corps in Hawai'i. The second subsystem is the Power Equipment Group (PEG), which provides power to the entire system via a generator mounted on the same MTVR. The third and final subsystem is the Communications Equipment Group (CEG), which provides the ability to communicate and control the radar. The CEG is mounted on a HMMWV, another vehicle commonly used by the Marine Corps in Hawai'i. This self-monitoring radar, which operates within Federal Communications Commission limits, automatically turns off if the system exceeds preprogrammed parameters to avoid harming personnel or the environment.
- Training. G/ATOR is designed to be flexible to support a variety of different missions. The G/ATOR's expeditionary design enables Marines to transport it using fewer personnel and vehicles and set it up faster and more efficiently than the legacy systems it replaces. Typical training would involve the radar crew practicing system physical setup, including lowering the legs, applying power, and raising and spinning the main antenna array without emitting radio waves. If training requires, the system can be energized to provide surveillance of airspace; however, most of the training is accomplished without electromagnetic emissions.

Photo 5: G/ATOR System

2.1.2 Facilities

The proposed action also upgrades, renovates, and constructs new administrative, armory, and operational support facilities at MCB Hawaii Kaneohe Bay (see Figures 2-1 and 2-2 later in this chapter). None of the facilities proposed for renovation, modernization, or demolition under the preferred alternative are listed or eligible for listing in the National Register of Historic Places (NRHP). All proposed construction would occur on previously developed, paved, or landscaped areas. Water, sewer, and electrical utilities would be improved, as necessary, within the proposed construction footprints. All new facilities would be constructed with Low Impact Development (LID) elements and appropriate BMPs to

maintain stormwater discharges to pre-development hydrologic conditions. Ordnance storage and use for ground forces training would not change as a result of the proposed action, and no ordnance storage would occur at any of the facilities. A summary of key facility components is described below:

1. 3d Marine Littoral Regiment (MLR) Armory Expansion. This project would expand and upgrade an existing armory, Building 4053 (B4053), to provide additional weapons storage, maintenance areas, and a weapons cleaning area.
2. 1st Littoral Anti-Air Detachment (LAAD) Battalion Compound. This project would consolidate existing MCB Hawaii Kaneohe Bay functions by constructing an operational compound consisting of a collocated communications maintenance shop, automotive shop, storage facilities, training space, Headquarters offices, expansion of an existing armory, and an operational vehicle laydown area with overhead vehicle covers.
3. NMESIS Facility. This project would demolish facilities at an existing compound previously used for storing and maintaining amphibious vehicles to construct a new operational NMESIS compound. The compound would consist of a controlled humidity warehouse, equipment maintenance shop, electronic communications infrastructure, automotive organizational shop, and JLTV parking areas.
4. Consolidated Secure Communications Facility. This project would consolidate, expand, and upgrade existing communications facilities on base through construction of a two story, consolidated secure communications building.
5. 3d Littoral Anti-Air Battalion (LAAB) Air Control Battery Compound. This project would consolidate, expand, and upgrade existing functions by constructing an operational compound. The two-story building would have a maintenance facility, Headquarters offices, secure communication facilities, a controlled humidity warehouse, and an open-walled, steel-framed equipment canopy.
6. Live Virtual Constructive Training Environment. This project would consolidate, expand, and upgrade existing training facilities on base through construction of a classroom, simulators, and operations' trainers.
7. Consolidated Paraloft and Dive Shop and 3d Radio Battalion Boat Shop. This project would consolidate, expand, and upgrade existing facilities on base through construction of a paraloft facility with 120-foot drying tower and a boat/dive maintenance shop.
8. G/ATOR Climate Controlled Warehouse and Pad. This project would construct a climate-controlled warehouse on the west side of Mōkapu Road to store and maintain the G/ATOR radar. A wall surrounding an existing concrete pad inside Pyramid Rock would be demolished, and the pad would be re-used for training. This project would also involve demolition of B1180 and re-paving the associated parking lot.

2.1.3 Training

2.1.3.1 Training with Modernized Equipment

NMESIS, MADIS, L-MADIS, and G/ATOR would be utilized on all existing Marine Corps training areas on Oʻahu, and on non-Marine Corps ranges controlled by the Army and Navy within the state of Hawaiʻi, as well as at overseas and Continental U.S. locations, in accordance with training schedules and emerging

combatant commander employment requirements. The analysis in this document focuses on Marine Corps-controlled training areas on O‘ahu because Marine Corps training activity on other Service ranges is addressed in their range-specific documents. As detailed in this document, Marine Corps training with modernized equipment would not increase activity or impose new or greater environmental impacts on these training ranges. Therefore, the analysis in this document focuses on changes in training intensity on Marine Corps-controlled ranges.

Given the advancement of technology and modernization of equipment, high live-fire costs, and the ability to train using simulators, a large portion of the field training conducted on O‘ahu with the modernized equipment will involve virtual or “digital” non-live-fire training without the expenditure of munitions. Training on these new systems will consist of maneuvering on existing ranges and range areas. Because these systems would replace and upgrade legacy equipment, the operational employment of the NMESIS, MADIS, L-MADIS, and G/ATOR would be similar to the tactics employed by legacy equipment. Established vehicle paths and approved areas would be used to set up and employ the equipment within the ranges; no new or expanded training areas are proposed in this action. Units training with the NMESIS would engage in setup and employment tactics similar to those used by current cannon batteries, with the important distinction that the proposed NMESIS units would not engage in live fire. MADIS and L-MADIS systems would be employed similar to current anti-aircraft systems utilizing light tactical vehicles in maneuvering, targeting, and simulated firing. The G/ATOR would replace a family of radars currently in use and used daily on O‘ahu and would not require additional Federal Communications Commission spectrum approval.

As discussed in Section 2.1.1, *Equipment*, the NMESIS and MADIS are mounted on JLTVs, which first began production in 2016 and entered the Marine Corps inventory in 2019. The JLTV is smaller and lighter than the legacy HMMWV and both vehicles are currently used on O‘ahu ranges. The L-MADIS system is mounted on a ULTV, which is similar to a commercial off-road utility vehicle, and is smaller and lighter than the UTV currently used on O‘ahu ranges. The L-MADIS system would operate in a similar manner to the existing anti-aircraft training previously conducted by equipment mounted on the Marines’ existing UTV. While the G/ATOR radar is a new piece of equipment, it would be mounted and towed on vehicles currently used in training on O‘ahu as described in Section 2.1.1.3.

Access to non-Marine Corps ranges in Hawai‘i occurs through prior coordination and permission from Army and Navy range management, who give priority scheduling and training to their Service units. For this reason, and because the Marine Corps cannot unilaterally propose an increase in training or train inconsistent with approvals on these non-Marine Corps ranges, this EA addresses only environmental impacts on Marine Corps-controlled installations. This document assumes that training on non-Marine Corps ranges would remain consistent with historical use rates and within the scope of environmental impacts discussed in other Service environmental analyses for their ranges.

The type of training and associated activities would be similar to training historically conducted by Marine ground forces at training areas in Hawai‘i. With the need to have smaller, low signature, mobile forces, modernized equipment has been designed to meet evolving EABO concepts. As such, modernized equipment and training in Hawai‘i compared to legacy equipment and training has, overall, a lesser impact to the environment. Current ground-based training involves vehicles and personnel traveling from MCB Hawaii Kaneohe Bay to a training location within one of the three training areas, using established vehicle paths and/or approved areas to move from one location to another, setting up the equipment in a particular location, operating the equipment in that area, and then demobilizing and moving either to another location within the training area or back to MCB Hawaii Kaneohe Bay. In some

cases, the personnel would camp overnight at the location as part of the training. Current training adheres to guidance identified in MCB Hawaii Order 1500.9C, *Standing Operating Procedures for Marine Corps Base Hawaii Ranges and Training Areas* (MCB Hawaii, 2021a). These training concepts would be similar for training with modernized equipment. Specific descriptions of proposed training with each modernized equipment type are summarized below.

NMESIS. Units training with the NMESIS would engage in setup and employment tactics similar to those used by current cannon batteries, with the important difference being the proposed NMESIS units would not engage in live fire on O‘ahu. A NMESIS training event consists of a five-vehicle section of JLTVs. Two vehicles, the leader vehicle, and a command-and-control vehicle, would drive to the training area, while the three JLTV launcher vehicles would be loaded on a flatbed tractor trailer and transported to the training area. Once at the training area, Marine Corps forces would travel to a location on the range, occupy notional firing positions, establish communications with other Marine Corps units operating in conjunction with them passing information and target data across legacy and approved communication data systems. This simulated target data would be relayed to NMESIS ground forces, who would then simulate firing at a simulated target (i.e., no actual firing of the weapon system would occur). NMESIS training participants would then break down the equipment and move to another location to repeat the process. Live-fire training with the NMESIS would not be conducted on O‘ahu.

MADIS. While a portion of MADIS training can be conducted virtually, because it is a crew-operated system, training must occur on O‘ahu Marine Corps RTAs so Marines can practice crew coordination in their assigned seat. During field training, the two-vehicle MADIS system would accompany small contingents of Marines to establish a GBAD position. This would include the MADIS maneuvering to the site, covering and concealing the equipment, communicating with adjacent units and higher headquarters, acquiring targets using radar, “digitally firing” upon a simulated target, breaking down the equipment, moving to another location, and repeating the process.

L-MADIS. L-MADIS systems would be employed similar to current UTV-mounted systems in maneuver, practicing surveillance, and setting up a defense. Field training would consist of the L-MADIS two-vehicle system accompanying small contingents of Marines to establish a GBAD position. Training would mimic the MADIS training described above, but on a smaller scale, to include maneuvering to the site, covering and concealing the equipment, communicating with adjacent units and higher headquarters, acquiring targets, breaking down the equipment, moving to another location, and repeating the process.

G/ATOR. The G/ATOR would replace a family of radar currently in use on O‘ahu and operates within existing frequencies, similar to those used by civilian and military radars on the island. Training at MCB Hawaii Kaneohe Bay would occur at two locations: a former radar site near Pyramid Rock and a former Sensor Compound on the east side of the base. Both locations are the current and former sensor sites for radars the G/ATOR system is replacing. The G/ATOR would also be used on other training ranges within the state of Hawai‘i. Typical training would involve the radar being towed to a training area. The radar crew then practices system physical setup, including lowering the legs, applying power, then raising and spinning the main antenna array without emitting radio waves. If training requires, the system can be energized to provide surveillance of airspace; however, most of the training would be accomplished without emissions.

2.1.3.2 Training Locations

NMESIS, MADIS, L-MADIS, and G/ATOR would be utilized on all existing Marine Corps training areas on O‘ahu, and on non-Marine Corps ranges controlled by the Army and Navy within the state of Hawai‘i.

Marine Corps training on Army and Navy ranges is limited to that which is allowed through prior coordination and permission from the individual range managers. Any training on other Service ranges must be in conformance with their individual range rules and their corresponding authorizations. As such, Marine Corps training with the modernized equipment would only occur where already specifically permitted by the Army and Navy. Consequently, this EA only analyzes the impacts of training with the modernized equipment on Marine Corps-controlled training areas on Oʻahu.

MCB Hawaii Order 1500.9C, *Standing Operating Procedures for Marine Corps Base Hawaii Ranges and Training Areas*, details restrictions, avoidance areas, and training processes to protect sensitive natural and cultural resources on Marine Corps ranges. The Marine Corps currently conducts ground-based training at Marine Corps training areas at MCB Hawaii Kaneohe Bay, MCTAB, and Puʻuloa RTF. Current training minimizes potential impacts to biological and cultural resources by adhering to procedures established per the MCB Hawaii Integrated Natural Resources Management Plan (INRMP), the Integrated Cultural Resources Management Plan (ICRMP), and MCB Hawaii Order 1500.9C. Chapter 2 of this order includes specifications for environmental coordination, identification of environmental constraints, and identification of specific off-limit areas and prohibited activities. Specific elements relating to resources include:

- Specifying how to manage and report fuel spills or hazardous materials incidents.
- Coordinating with the base Environmental Compliance and Protection Division (ECPD).
- Avoiding damage to beach foliage, trees, and shrubbery by transiting only on existing roadways and trails.
- Limiting digging and other ground disturbance to 6 inches below the existing surface except in previously approved areas.
- Parking in authorized areas.
- Avoiding the following activities except where previously approved:
  - Disposing of trash, explosive material, or hazardous materials/waste.
  - Any release of oil, fuel, or hazardous materials onto the ground or into the water.
  - Removal or intentional destruction of plants, trees, brush, or other vegetation.
  - Killing, injuring, or harassing wildlife.
  - Removal or intentional destruction of archaeological materials or archaeological sites.
  - Use of detergents or chemicals for cleaning/maintaining vehicles and equipment.
  - Hunting without MCB Hawaii permission.
  - Ground disturbance within the Pyramid Rock Training Area Military Operations on Urbanized Terrain (MOUT) (i.e., within the Mōkapu Burial Area [MBA]).
  - Use of live ordnance without MCB Hawaii approval.
- Avoiding off-limit areas:
  - Wetlands at MCB Hawaii Kaneohe Bay.
  - Areas of historic significance at MCB Hawaii Kaneohe Bay.
  - Waimānalo Stream.
  - State of Hawaiʻi and private property.

Marine Corps Training Areas on O'ahu

MCB Hawaii Kaneohe Bay. MCB Hawaii Kaneohe Bay (see Figure 1-2) is located on the windward side of O'ahu. The installation covers the entirety of the Mōkapu Peninsula, which separates Kāne'ohe Bay from Kailua Bay. MCB Hawaii Kaneohe Bay ranges shown in Figure 1-3 support platoon and smaller unit level live fire and maneuver training. Types of training include vehicle maneuver, foot patrols, obstacle course training, gas chamber, driving simulator and virtual small arms training, MOUT, fast rope and rappelling training, amphibious training, and limited live-fire training. There are two non-live-fire amphibious beaches (Pyramid Rock and Fort Hase), a live-fire shoot house, an Infantry Immersion Trainer, a helicopter/MV-22 landing zone (LZ), a non-live-fire training area, and an underwater egress trainer, all supporting pre-deployment training. The Main Site training area has a total of 15 ranges located in the Ulupa'u Crater that support individual and small unit live-fire training. Training, consisting of vehicle maneuver, foot patrols, and amphibious landings, occurs year-round throughout the installation.

Under the proposed action, existing training would continue on MCB Hawaii Kaneohe Bay pursuant to established range protocol, but now using modernized equipment; for example, JLTVs instead of 7-ton trucks, NMESIS non-live-fire batteries versus cannon live fire, and training with smaller, more dispersed forces.

MCTAB. MCTAB (see Figure 1-4) encompasses 1,072 acres approximately 8 miles south of MCB Hawaii Kaneohe Bay and adjacent to Bellows Air Force Station and between the communities of Kailua and Waimānalo. MCTAB is the primary Marine Corps training area on O'ahu and provides maneuvering space for training activities to include amphibious training, air and ground maneuver training, Land Navigation training, MOUT, Barrier Obstacle Training, vehicle operator's confidence training, and Search and Rescue training. MCTAB supports company and below unit level non-live-fire amphibious, helicopter, and urban training, and motorized exercises in conjunction with troop land maneuver training. No live-fire ranges are located at MCTAB; however, for realism, simulation pyrotechnics are used during Infantry Immersion Training within the urban training facilities. Each weekend, Training Area 1 is closed to military activities from noon Friday until 8 a.m. Monday to allow recreational use of the beach.

Pu'uloa RTF. Pu'uloa RTF (see Figure 1-5) is a 162-acre training area on the eastern edge of 'Ewa Beach and just west of the Pearl Harbor entrance channel. Civilian housing borders its east and west sides, respectively. Pu'uloa RTF supports live-fire training for small arms training, qualification, and requalification. It is used by the Marine Corps and other DoD services and local law enforcement agencies.

Non-Marine Corps Controlled Training Areas

Marine Corps ground forces in Hawai'i also train at the Army and Navy training areas listed below (see Figure 1-6). Marine Corps training on Army- and Navy-controlled ranges occurs through scheduling requests to the range managers. As described in Section 2.1.3, *Training*, the type of proposed training that would occur with modernized Marine Corps equipment on these ranges is similar to the type of training currently and historically conducted by Marine Corps ground forces in Hawai'i at these ranges. The proposed action would not increase the frequency, duration, or impact of Marine Corps training activities over those currently authorized on these ranges, and, in some cases (such as the substitution of NMESIS for legacy cannon batteries), this modernized training would reduce the environmental impact of Marine Corps activity on those ranges. Training at non-Marine Corps ranges under the proposed action would comply with current operational, environmental, and cultural restrictions at

these ranges. Because the proposed action does not involve an increase in the type or frequency of Marine Corps training on non-Marine Corps ranges, training on non-Marine Corps ranges is described below but not analyzed in this document.

- Schofield Barracks Military Reservation. Schofield Barracks Military Reservation consists of a spectrum of ranges from individual to platoon attack, small arms, mortar, and artillery. Schofield provides the Marine Corps with the only training area on O'ahu capable of supporting both 60mm and 81mm mortar live training. Marine Corps training at Schofield Barracks includes unit live-fire maneuver, small arms live-fire up to .50 caliber, and grenade training, as well as company, troop, and battery level field training.
- Kahuku Training Area. This is the largest maneuver area on O'ahu used by the Army, Marine Corps, Reserves, and National Guard. Marine Corps training at Kahuku Training Area largely focuses on non-live-fire sensor and maneuver training, helicopter training, and establishing expeditionary bases.
- Kawailoa-Poamoho Training Area. This is state-owned land used for non-live-fire maneuver training and low-altitude helicopter flight training.
- Dillingham Military Reservation. Dillingham Military Reservation supports platoon- and squad-sized maneuvers. Marine training at Dillingham is similar to Kahuku Training Area and also supports C-130 and helicopter troop insert and egress training.
- Makua Military Reservation. Makua Military Reservation is used for air assault training, ground training, helicopter, and UAS training. Marine Corps training at Makua focuses on UAS training and non-live-fire sensor training as well as establishing expeditionary bases.
- Pohakuloa Training Area. Pohakuloa Training Area supports company-size live-fire training, anti-tank weapons employment, helicopter aerial gunnery, artillery, UAS, close air support, and is the only set of ranges in the Hawaiian Islands capable of supporting combined arms training. Marine Corps training at Pohakuloa Training Area focuses on higher level and more complex training such as combined arms training which cannot be accomplished anywhere else in Hawai'i.
- Pacific Missile Range Facility. Pacific Missile Range Facility is primarily used by Marine Corps forces during large scale exercises such as the Rim of the Pacific (RIMPAC).

Training Events off Hawai'i

In addition to these ranges, Marine Corps forces travel to ranges located within the Continental U.S. and overseas for DoD and joint training exercises such as RIMPAC. As with non-Marine Corps controlled training areas on Hawai'i, the proposed action does not involve increasing the frequency or changing the type of these off-island training events, and therefore they are not analyzed in this document.

2.2 Alternatives

NEPA requires agencies to consider reasonable alternatives to the proposed action. The identification, consideration, and analysis of alternatives are important aspects of the NEPA process and contribute to the goal of objective decisionmaking. The range of alternatives includes reasonable alternatives (which meet the purpose and need of the proposed action) that must be rigorously and objectively explored, as well as other alternatives that were considered but eliminated from detailed analysis. A No-Action Alternative must also be included as a baseline for analysis.

2.2.1 Alternatives Considered but not Carried Forward for Analysis

The Marine Corps considered and eliminated from detailed analysis two training alternatives because they did not meet the purpose and need for the proposed action.

- Solely Virtual Training. The Marine Corps currently employs a large variety of training methods including classroom training and simulations, virtual training (e.g., positioning equipment and doing virtual firing without expending munitions), and real-world maneuver and live-fire training. Virtual training is an important supplement to real-world training experience but cannot replace the experience of physically operating the equipment in a live training environment. Physical use of the equipment develops familiarity and proficiency with the equipment and with the order of operations. The agile and responsive nature of modern training concepts requires that Marines train in the field in order to practice resolving and adapting to changing conditions. Relying entirely on virtual and classroom training would not meet the purpose and need of this action as it would not allow Marine Corps ground forces in Hawai'i to meet Marine Corps requirements set forth in Title 10 U.S.C. Section 8063. Therefore, this alternative is not carried forward for analysis.
- Training Outside Hawai'i. Marine Corps ground forces in Hawai'i currently train on Army and Navy ranges on and off O'ahu, as well as at Continental U.S. and overseas locations. Increasing "off-island" training away from O'ahu ranges was considered and dismissed as a viable action alternative. In addition to the cost and logistical burdens associated with traveling off-island for training, increased training at Army and Navy training areas, even within the Hawaiian Islands, is infeasible because the Marine Corps does not have assured access to these ranges, resulting in decreased and unpredictable training opportunities. Under existing conditions, Marine Corps training can be scheduled only when other Service training is not underway on the range or when there are large-scale training events. Reliance on large-scale exercises such as RIMPAC or overseas joint training events would result in an unacceptable level of uncertainty as to when and whether units could meet their training requirements. This uncertainty would negatively impact unit readiness inconsistent with the purpose and need of the proposed action.

2.2.2 Alternatives Carried Forward for Analysis

The proposed action includes equipment modernization, facilities improvement, and training necessary to enable Marine Corps ground forces in Hawai'i to meet their Title 10 requirements. This equipment and training is necessary to support the emerging joint, naval, and Marine Corps operating concepts. As such, there is no alternative equipment or required training for that equipment that would enable Marine Corps ground forces in Hawai'i to meet the purpose and need. Therefore, alternatives analysis for facilities and for training tempo is presented in the respective subsections below.

2.2.2.1 Facilities

Proposed support facilities must be located at MCB Hawaii Kaneohe Bay where these Marine Corps ground forces are physically located. Facilities planning considered existing facilities use, future growth at the installation, and mission flexibility, as well as minimization of environmental and cultural resource impacts. As such, the proposed infrastructure was developed to align with existing uses and reduce, to the greatest extent possible, environmental and cultural impacts.

The Marine Corps considered all reasonable alternatives to support the facilities requirements. Reuse and renovation of existing facilities was initially considered for a number of reasons to include historic

resource preservation, avoidance of sensitive archaeological resources, and avoidance and/or minimization of potential biological resource effects. In developing facilities alternatives, the Marine Corps sought to maximize reuse and renovation of existing facilities and minimize the need for new construction. The preferred facilities' locations and descriptions are shown in Figures 2-1 and 2-2.

1. 3d MLR Armory Expansion. The newly reorganized 3d MLR, which is the main component of the modernized Hawai'i-based Marine Corps ground forces, as well its subordinate units and existing Hawai'i-based ground forces supporting the III Marine Expeditionary Force, requires an expanded armory, which is a specialized building with stringent physical security requirements for weapons storage. Weapons systems would be stored and maintained at the armory, but no ordnance would be handled or stored at this location. Armories must be located at MCB Hawaii Kaneohe Bay for ease of access to small arms and crew-served weapons used by Hawai'i-based Marine Corps ground forces. The following alternatives were considered:

    a. Preferred alternative – Renovate and expand an existing armory (B4053). Existing spaces within B4053 would be renovated to better configure weapons storage and issue. Expansion of B4053 would allow for consolidated weapons storage as well as a weapons maintenance shop and weapons cleaning area. Ordnance associated with weapons stored in the armory would be kept in existing weapons magazines onboard MCB Hawaii Kaneohe Bay. This alternative would lead to more efficient weapons storage, management, and maintenance for Hawai'i-based Marine Corps ground forces.
    b. Use of existing armories – Under this alternative, units would use B4053 in its current condition as well as existing and additional modular armories. This alternative is not preferred because the existing capacity in B4053 is limited, requiring the displacement of weapons storage to multiple facilities. This leads to inefficient management of the weapons and their maintenance.

2. 1st LAAD Headquarters & Service (H&S) Battery Compound. The 1st LAAD H&S Battery requires facilities to meet its new anti-air mission, including administrative, maintenance, and vehicle storage/staging areas. The following alternatives were considered:

    a. Preferred alternative – This alternative involves construction of a compound near Building 4052, located in the east portion of the base on 3rd Street, adjacent to the drainage canal. This would involve demolition of seven small buildings, a parking lot, and a ball field, and the construction of a communications maintenance shop and launcher/projectile shop building, a two-story automotive organization shop with maintenance bays and administrative spaces, a storage facility, a battery headquarters and training facility, a vehicle laydown area, and an expansion of an existing armory. As with the armory for the 3d MLR, ordnance associated with weapons stored in this armory would be kept in existing ordnance magazines at MCB Hawaii Kaneohe Bay.

    b. Reuse of existing space/facilities – This alternative involves construction of a compound near Building 6468 and use of modular armories. This alternative is not preferred because the space surrounding Building 6468 is limited, resulting in a more constrained footprint and operational inefficiency. Finally, as with the prior facility project, the use of modular armories leads to inefficient weapons storage and maintenance.

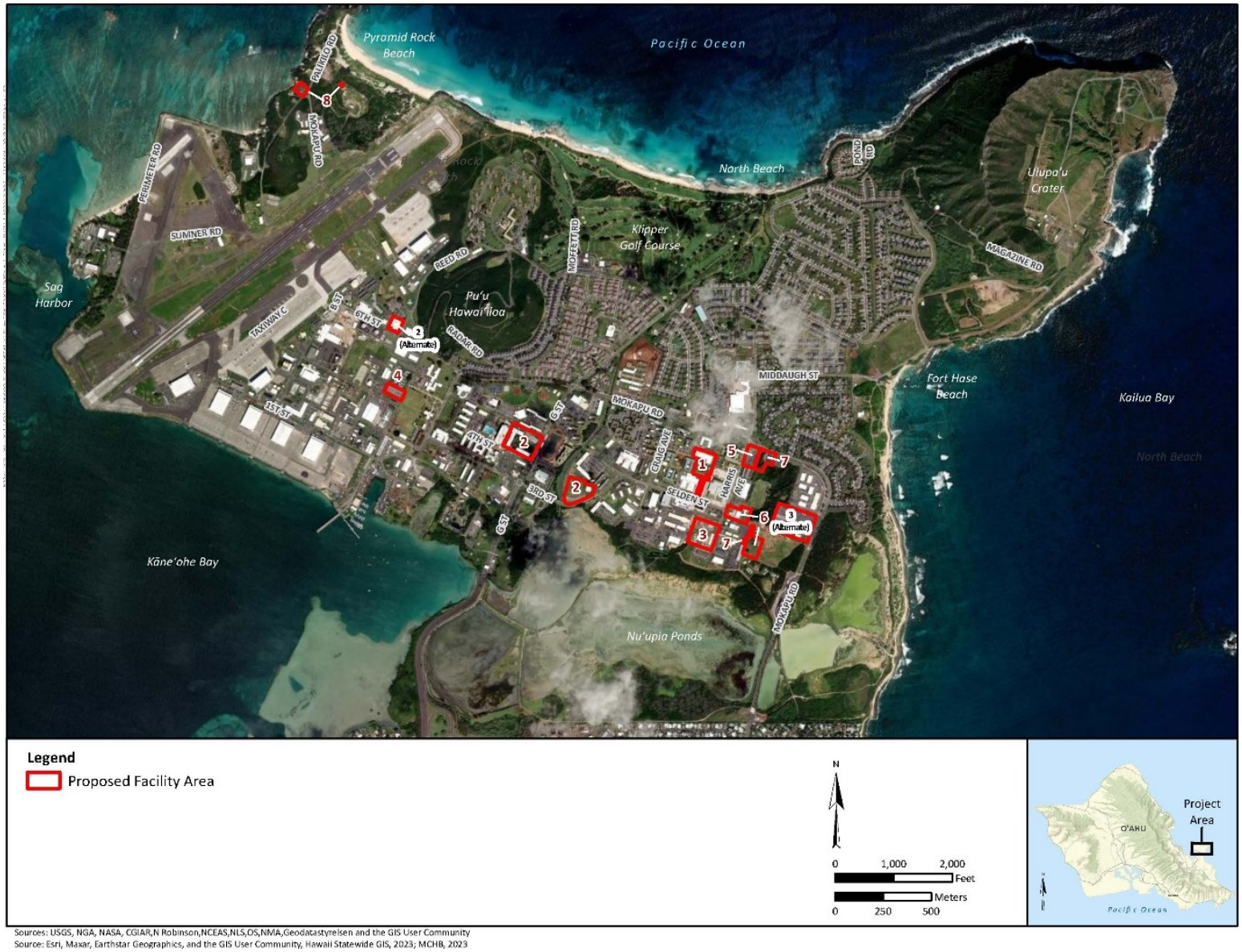

Figure 2-1 Proposed Facilities Preferred Locations, MCB Hawaii Kaneohe Bay

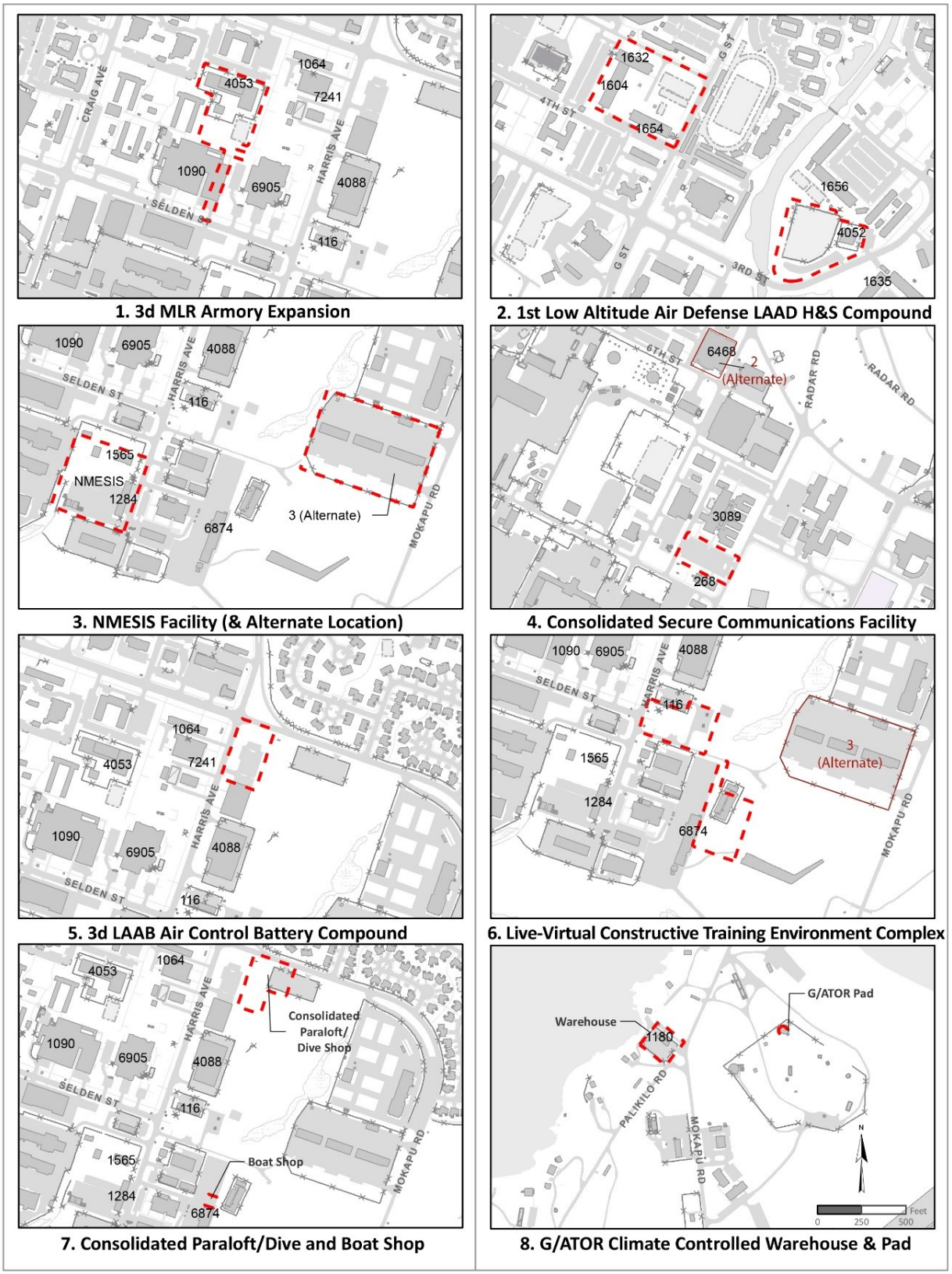

Figure 2-2 Proposed Facilities Project Footprints

3. NMESIS Facility. Facilities, including storage, maintenance, communications, and vehicle storage/staging facilities, are necessary to support this weapons system. The following alternatives were considered:

    a. Preferred alternative – This alternative involves construction of a NMESIS facility compound in the former Amphibious Assault Vehicle (AAV) Compound located on the east portion of the installation at the corner of Selden Street and Harris Avenue. This would involve the demolition of five existing, small AAV support facilities, temporary fabricated buildings, and wash pads; the construction of a launcher/projector maintenance shop, controlled humidity warehouse for NMESIS weapons system storage, an administrative support area in the maintenance area; a two-story electronic/communications maintenance shop; and an automotive organizational shop with an administrative support area for the NMESIS JLTV vehicles. No ordnance for the NMESIS weapons system would be stored in this facility compound.

    b. Construction of a NMESIS facility compound in the former 1/12 Gun Park – This alternative would involve the demolition of various small buildings in the 1/12 Gun Park; renovation of Buildings 5000 and 5001 in the 1/12 Gun Park for a controlled humidity warehouse and an electronics/communications maintenance shop; renovation of Building 5011 for the launcher/projector maintenance shop; and construction of a new automotive organizational shop. This alternative is not preferred because there is limited clear space between buildings in the 1/12 Gun Park to allow the expansion required to meet NMESIS facility requirements.

4. Consolidated Secure Communications Facility. Marine Corps ground forces in Hawai‘i using modernized weapons systems and sensors require greater use of secured communications, information, and intelligence capabilities and facilities to make full use of their capabilities. The following alternatives were considered to increase this capability:

    a. Preferred alternative – This alternative involves construction of a consolidated secure communication facility located near the 3d MLR Headquarters in the central portion of the installation off D Street, between existing buildings 3089 and 268. This would involve the construction of a two-story building to house secure communications spaces, unclassified administrative spaces, and training areas.

    b. Use of existing secure communications facilities – This alternative would involve use of existing buildings and mobile structures located throughout the base. It is not preferred because existing secure communications spaces for the 3d MLR and its subordinate units provide limited workstations to support the full operational capability of the 3d MLR and its subordinate units. Further, these facilities are currently distributed throughout the installation, impeding or precluding efficient integration and communication between MLR elements to allow effective use and training on the modernized weapons systems.

5. 3d LAAB Air Control Battery Compound. This project would involve construction of the Battery Headquarters, Maintenance Shop, and a Vehicle Staging Area. This would be used for administrative functions and for storage and maintenance of NMESIS equipment. The following alternatives were considered:

    a. Preferred alternative – Construct a Marine Air Control Battery building in the ground support area of MCB Hawaii Kaneohe Bay. This would involve new construction, with the Marine Air unit operations building for administration and classified communications material storage constructed near the existing 3d LAAB Headquarters building, in the ground support area of

MCB Hawaii Kaneohe Bay. Consolidating the functions of the LAAB Air Control Battery into one location would improve efficiency of the MLR.

b. Reuse of existing space/facilities – This alternative would use the former 1/12 Sensor Compound at Building 1551 which functions as the Air Control Battery Compound. This alternative is not preferred because the building is located within the 100-year floodplain, straddling Federal Emergency Management Agency (FEMA) Flood Zones VE and AE and within the Tsunami Evacuation Zone. There is insufficient height clearance within the existing G/ATOR space to properly raise the array and conduct maintenance on the G/ATOR. The space is naturally ventilated, with no climate control equipment or wall insulation, and the facility is located within 500 feet of the ocean, with prior flooding events having occurred at the facility during major storms.

6. Live-Virtual Constructive Training Environment Complex. Hawai'i-based ground forces require access to virtual training facilities to meet expanded training requirements and to ensure proper use of modernized weapons and sensor systems when deployed to the field. The following alternatives were considered:

   a. Preferred alternative – Construct a new one-story consolidated virtual training facility located in the ground support area at MCB Hawaii Kaneohe Bay that will have virtual trainers for various infantry, vehicle, and tactical training functions; storage and maintenance areas for virtual training equipment; and office space, classrooms, and an auditorium.

   b. Use of existing facilities – This alternative would continue to use existing virtual training facilities on base. This alternative is not preferred because existing virtual training facilities are scattered around the installation and typically housed in trailers. This leads to inefficient training that reduces instructor effectiveness and adds a logistical burden to deploying units. Further, existing facilities are insufficient to meet the expanded training needs of modernized Hawai'i-based ground forces.

7. Consolidated Paraloft/Dive Shop and Boat Shop. Modernized parachute, diving, and boating facilities are required to improve Hawai'i-based ground forces efficiency and effectiveness. The following alternatives were considered:

   a. Preferred alternative – Construct a consolidated paraloft/dive shop and boat shop in the ground support area of MCB Hawaii Kaneohe Bay, behind Parking Structure 7245 (paraloft/dive shop) and adjacent to Building 6874 (boat shop). The paraloft portion of the paraloft/dive shop facility would be used for packaging, storage, and cleaning of parachutes. The dive shop portion would be used for the maintenance of diving equipment. The boat shop would be new construction to provide maintenance to small boats and would be located in the existing 3d Radio Battalion Auto Organization shop complex.

   b. Use of existing facilities – This would involve use of existing facilities for the dive shop, boat shop, and paraloft. This alternative is not preferred because it does not fully support operational capabilities. Use of existing facilities would also result in maintenance activities conducted at multiple locations, creating operational and logistics inefficiencies.

8. G/ATOR Climate Controlled Warehouse and Pad. Facilities, including storage, maintenance, communications, and vehicle storage/staging facilities, are necessary to support this equipment. The following alternative was considered:

a. The controlled humidity warehouse for the G/ATOR radar would be located in a compound that currently houses Building 1180 in the Pyramid Rock area of MCB Hawaii Kaneohe Bay. Building 1180 would be demolished, allowing construction of the controlled humidity warehouse in this area. This would enable the G/ATOR radar to be stored and maintained close to the area where it will be employed for training, which is on high ground with a pad located adjacent to the Pyramid Rock MOUT site. To minimize potential ground disturbance in areas of the Pyramid Rock Training Area (which is in the MBA), the Marine Corps revised the siting concept to use an existing concrete pad rather than a new one, avoid any utilities trenching to the pad, and locate the G/ATOR Climate Controlled Warehouse at the existing Building 1180 location outside of the MBA.

b. No other alternatives meeting the purpose and need were identified for this facility.

2.2.2.2 Training

The Marine Corps has identified alternatives to the level of training with modernized equipment on Oʻahu. To develop these training alternatives, the Marine Corps reviewed historic training activity on Oʻahu at MCB Hawaii Kaneohe Bay, MCTAB, and Puʻuloa RTF to develop a baseline of training frequency on the three Marine Corps ranges on Oʻahu[1]. As previously noted, the number of training events that would occur at non-Marine Corps ranges would remain at the same level as prior to the modernization proposal and, therefore, were not included in the development of alternatives. Averaging the last three non-COVID-impacted training years results in 1,449 training events per year for all Marine Corps training areas (Table 2-1).

Table 2-1 Baseline Annual Training Events at Marine Corps Training Areas on Oʻahu

Location	*Baseline[1]*
Marine Corps Training Areas	
MCB Hawaii Kaneohe Bay	649
MCTAB	624
Puʻuloa RTF	176
Total	**1,449**

Notes: [1]Baseline tempo is average of pre-COVID annual tempo (2018–2019).

Legend: MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; RTC = Range Training Complex; RTF = Range Training Facility.

With this baseline of training activity, two potential action alternatives were identified:

- Alternative 1. This alternative proposes an annual average of approximately 1,500 training events on Marine Corps ranges on Oʻahu (see Table 2-2), consistent with historic Marine Corps range utilization on Oʻahu using legacy systems.
- Alternative 2. This alternative proposes a 20 percent (%) increase in training activity on Marine Corps ranges on Oʻahu to accommodate an increase in training attributable to transiting forces

[1] The Marine Corps referenced 2018, 2019, and 2022 training activity to generate a representative average of needed training; 2020 and 2021 were omitted due to the significant constraints the global pandemic placed on military training.

and increased operational activity resulting from smaller, more frequent training evolutions (see Table 2-2).

Alternatives to facilities laydowns are independent of the alternative levels of training activity with the modernized equipment. Therefore, these alternatives are presented separately within the "Facilities Alternatives" section. Selection of a particular location for a support facility aboard MCB Hawaii Kaneohe Bay does not affect the training alternatives analyzed in this document.

2.2.3 Alternative 1

Table 2-2 presents existing training at Marine Corps training areas compared to proposed training Alternatives 1 and 2. Table 2-3 provides an estimate of vehicle miles traveled to execute existing and proposed training. Alternative 1 would include the same modernized equipment, type of training, and facilities modernizations described in Section 2.2.2.1.

Table 2-2 Existing and Proposed Annual Training Events at Marine Corps Training Areas

Location	*Baseline[1]*	*Alternative 1[2]*	*Change*	*Alternative 2[3]*	*Change*
MCB Hawaii Kaneohe Bay (RTC + on base)	649	649	0	779	130
MCTAB	624	624	0	749	125
Pu'uloa RTF	176	176	0	211	35
Grand Totals	**1,449**	**1,449**	**0**	**1,739**	**290**

Notes: [1]Baseline tempo is average of pre-COVID annual tempo (2018–2019).
[2]Alternative 1 tempo is described in Section 2.2.3.
[3]Alternative 2 tempo is described in Section 2.2.4.

Legend: MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; RTC = Range Training Complex; RTF = Range Training Facility.

Table 2-3 Existing and Proposed Annual Vehicle Trips

Location	*Baseline[1]*	*Alternative 1[2]*	*Change*	*Alternative 2[3]*	*Change*
Vehicles Off Base					
Annual	4,207	4,207	0	5,048	841
Monthly	351	351	0	421	70
Daily	12	12	0	14	2
Trips Off Base					
Annual	1,829	1,829	0	2,195	366
Monthly	152	152	0	182	30
Daily	5	5	0	6	1

Notes: [1]Baseline tempo is average of pre-COVID annual tempo (2018–2019).
[2]Alternative 1 is described in Section 2.2.3.
[3]Alternative 2 is described in Section 2.2.4.

2.2.4 Alternative 2

Alternative 2 would include the same modernized equipment, type of training, and facilities modernizations described in Section 2.1, but training tempo would increase by approximately 20% over baseline levels. This increase to baseline would accommodate an increase in training attributable to transiting forces and Marine Corps ground forces in Hawai'i. As a result, Marine Corps training areas would see increased operational activity resulting in smaller but more frequent training evolutions.

2.2.5 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur. Training activities would be limited to the existing equipment and associated training levels and facilities for Marine Corps ground forces in Hawai'i. The No-Action Alternative does not meet the purpose and need for the proposed action because it would not enable the restructuring of Marine Corps ground forces in Hawai'i to meet its Title 10 responsibilities to support emerging joint, naval, and Marine Corps operating concepts. However, as required by NEPA, the No-Action Alternative is carried forward for analysis in this document.

2.2.6 Best Management Practices

BMPs are policies, practices, and measures the Marine Corps would implement as part of the proposed action to proactively avoid or minimize potential environmental impacts. They are distinguished from potential mitigation measures because BMPs are either specific requirements applicable to the proposed action or established regularly occurring practices routinely implemented for Marine Corps projects. In other words, the BMPs identified in this document are inherently part of the proposed action and are not proposed mitigation measures specifically identified as part of this NEPA environmental review process. Table 2-4 lists BMPs that would be implemented as part of the proposed action. Proposed mitigation measures are discussed separately in Chapter 3.

Table 2-4 Proposed Best Management Practices

Conservation Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Stormwater Management	Minimize pollutants in stormwater flows	Conservation measures used near or on the runways are filter socks around and filter fabric inside the storm drains to prevent pollutants from getting into the storm sewer system. Any sediment stockpile on the ramps would require filter socks and be frequently watered down using a water truck for dust control. At contractor trailer/staging areas, conservation measures include stabilized construction entrance and exits, boundary fencing with fabric, filter socks around perimeter, and/or silt fencing.	Construction
Stormwater LID Techniques	Minimize pollutants in stormwater flows	LID techniques such as bioretention, vegetated swales, and/or vegetated filter strips would be used as required for ongoing management and treatment of stormwater.	Training
Stormwater Permit Requirements	Minimize pollutants in stormwater flows	Requirements of the NPDES permit required for the discharge of stormwater associated with construction activity, including a SWPPP.	Construction
Stormwater Detention Basin	Minimize attraction of birds	The detention basin would be covered in a manner to avoid attracting birds.	Construction
Stormwater Diversion to Wetlands	Enhance water flow to wetlands	To the extent possible, incorporate diversion features that increase flow of stormwater to nearby wetlands, in coordination with MCB Hawaii ECPD Natural Resources staff.	Construction, Training

Conservation Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Cultural Resources	Avoid unintentional adverse impacts to unknown subsurface cultural resources, including historic properties that may be eligible for the NRHP.	Digging and other ground disturbance is limited to 6 inches below the surface. No fighting holes, bunkers, or trenches may be dug unless approved by the ECPD, except in previously approved areas. Removal of sand from beaches or shoreline for any purpose (i.e., filling of sand bags, making sand tables, personal use, etc.) is strictly prohibited (MCB Hawaii Order 1500.9C).	Construction, Training
Natural Resources	Avoid intentional adverse impacts to natural resources.	The following areas are off-limits or cannot occur for all training activities per MCB Hawaii Order 1500.9C: • MCTAB – no training is allowed within or adjacent to Waimānalo Stream. This includes a 100-yard buffer zone around the mouth of the stream. If a unit wishes to cross the stream for any reason, it must be coordinated with the RCO.	Training
Cultural Resources	Avoid intentional adverse impacts to known cultural resources including historic properties eligible for the NRHP.	The following areas are off-limits or cannot occur for all training activities per MCB Hawaii Order 1500.9C: • MCB Hawaii Kaneohe Bay – areas of historical significance; removal or intentional destruction of archaeological materials or artifacts or the disturbance to any archaeological site; ground disturbance will not be permitted within or around the Pyramid Rock Training Area MOUT (within the MBA).	Training
Pre-construction Surveys for Biological Resources	Minimize disturbance to sensitive species.	Pre-construction surveys for special-status species with the potential to occur would be conducted daily by a qualified biologist to ensure no species are present at the project sites. A biological monitor would conduct nest surveys in the existing trees at each site and within 100 feet of the proposed project sites. Nest surveys would be repeated within 3 days of project initiation and after any subsequent delay of work of 3 or more days. If a nest or active brood is found: • Contact the USFWS within 48 hours for further guidance. • A 100-foot buffer would be established and maintained around all active nests and/or broods until they have fledged. No potentially disruptive activities or habitat alteration would occur within this buffer. If a pueo is spotted on the ground during pre-construction surveys, a nest survey would commence within 200 meters of the observed pueo. If a nest is discovered, a 200-meter buffer would be erected to protect the nest.	Construction

Conservation Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Vegetation Trimming/Removal	Minimize disturbance to sensitive species	Removal, pruning, or trimming of trees and vegetation during bird nesting and bat pupping seasons would be avoided. • To the maximum extent practicable, tree trimming activities would avoid the peak white tern egg-laying months (March and October) and nest surveys would be conducted prior to tree disturbance. If the tree scheduled for removal, pruning, or trimming is found to contain a nest, the tree would not be disturbed until the chicks have fledged. • When trimming or removal of vegetation greater than 15 feet is needed, it is required to occur outside of the Hawaiian hoary bat pupping season to the maximum extent possible (June 1–September 15). If a bat is detected, tree trimming would not commence within 100 feet of the known roosting sites. If vegetation removal is proposed during the pupping season, consultation with USFWS is required.	Construction
Lighting	Bird/bat disorientation/fallout	Exterior lighting would follow MCB Hawaii "WILDLIFE FRIENDLY LIGHTING" standards (MCB Hawaii, 2022a). When exterior lighting is required, all exterior lights for new construction, replacement of existing fixtures, and renovations would meet or exceed USFWS, NOAA, and/or IDA standards unless otherwise required by the military mission, per the MCB Hawaii INRMP (MCB Hawaii, 2023a).	Construction, Training
Lighting	Minimize attraction of birds	Limit use of lights during the seabird fledging period September–December, especially during new moon phases.	Training
Lighting	Minimize sea turtle disorientation	Any lights required at night would use long wavelength (greater than 560 nanometers and absent wavelengths below 560 nanometers) light sources such as amber, orange, or red LEDs without the use of filters, gels, or lenses. Short wavelength light sources, PC Ambers, RGBs, dual lighting boards, and color change options are not acceptable (MCB Hawaii, 2023a).	Construction, Training
Fencing	Minimize Hawaiian hoary bat entanglement in barbed wire fencing	The proposed fencing would minimize use of barbed wire fencing with the goal of achieving no net gain in barbed wire fencing.	Construction
Landscaping	Preferential planting of native plants.	Include native plant vegetation restoration and landscape repair where possible for landscaping of new and renovated facilities.	Construction

Conservation Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Education	Minimize indirect effects to ESA-listed species from contractors, personnel, and dependents	All construction contractors and personnel would participate in MCB Hawaii's existing natural resources education program. The program would include, at a minimum, the following topics: (1) occurrence of natural resources (including ESA-listed species); (2) sensitivity of the natural resources to human activities; (3) legal protection for certain natural resources; (4) penalties for violations of federal law; (5) general ecology and wildlife activity patterns; (6) reporting requirements; (7) measures to protect natural resources; (8) personal measures that users can take to promote the conservation of natural resources; and (9) procedures and a point of contact for ESA-listed species observations.	Construction, Training

Notes: ARPA = Archaeological Resources Protection Act; ECPD = Environmental Compliance and Protection Division; ESA = Endangered Species Act; IDA = International Dark-Sky Association; INRMP = Integrated Natural Resources Management Plan; LED = light-emitting diode; LID = Low Impact Development; MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; MOUT = Military Operations on Urbanized Terrain; NAGPRA = Native American Graves Protection and Repatriation Act; NHPA = National Historic Preservation Act; NOAA = National Oceanic and Atmospheric Administration; NPDES = National Pollutant Discharge Elimination System; NRHP = National Register of Historic Places; RCO = Range Control Officer; RTC = Range Training Complex; SWPPP = Storm Water Pollution Prevention Plan; USFWS = United States Fish and Wildlife Service.

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3 Affected Environment and Environmental Consequences

This chapter presents a description of the existing environment and an analysis of the potential direct and indirect effects of Alternatives 1, 2, and the No-Action Alternative (cumulative effects are presented in Chapter 4). The affected environment is the construction footprint at MCB Hawaii Kaneohe Bay; the training areas at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF; the roadways leading to/from Marine Corps training areas; and the immediately surrounding communities. The level of detail and analysis for each resource varies with the level of potential environmental impact.

"'Significantly,' as used in NEPA, requires considerations of both the degree of effects and the affected environment, such as society as a whole (e.g., human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of a proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant." (40 CFR Part 1501.3(b)).

Environmental impacts carried forward for more detailed analysis in this EA are noise, air quality, water resources, cultural resources, terrestrial biological resources, public health and safety, and transportation. Potential impacts to the resource areas described below are negligible or nonexistent and, therefore, are not carried forward for further analysis in this EA.

Geological Resources. The proposed action would require modification to and construction of new infrastructure on MCB Hawaii as described in Section 2.1.2. All construction would be in areas that are developed or have been previously disturbed. For construction within landscaped areas, proposed construction would be implemented on soils that have slow runoff, high permeability, and low erosion potential. Construction would be subject to USEPA NPDES Construction General Permit and site-specific Storm Water Pollution Prevention Plans (SWPPPs) specifically designed to minimize erosion and soil loss. Project design and construction engineering control BMPs such as erosion socks, erosion control blankets, silt fencing, and fiber rolls would further reduce any potential for erosion, minimize sedimentation, reduce the flow of stormwater, and minimize the transport of soils and sediment off-site. Regarding training, all training with modernized equipment would be similar to ground-based training that already occurs at the three Marine Corps training areas (MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF) and would be conducted at locations within each training area currently used for ground-based training with legacy equipment. Proposed training activities would not create expanded ground disturbance at any of the training areas and would follow procedures outlined in MCB Hawaii Order 1500.9C. As such, there would be no impact to geological resources. For these reasons, geological resources are not evaluated further in this EA.

Hazardous Materials and Waste. Construction activities would result in a short-term increase in the use of hazardous materials that would cease at the completion of construction. The hazardous materials to be used are common to construction and include such items as diesel fuel, gasoline, and propane to fuel the construction equipment; hydraulic fluids, oils, and lubricants; welding gases; paints; solvents; adhesives; and batteries. All hazardous materials would be handled and disposed of per applicable regulations for construction projects and consistent with other construction projects at MCB Hawaii Kaneohe Bay. This includes materials from facilities demolition/renovation activities such as lead and asbestos should these be encountered during construction. These materials, if encountered, would be taken by licensed transporters and disposed of in permitted landfill facilities in accordance with applicable federal, state, and local laws and regulations. Installation Restoration Program sites exist on base, one of which (the former Quarry Pit Landfill) is near Projects 5, 6, and 7. For construction occurring in the vicinity of Installation Restoration Program sites, hazardous materials and waste, if encountered,

would involve additional excavation and disposal at an approved Restoration Conservation Recovery Area facility. The types of land use control issues for construction in these areas include coordination with DOH, development of a site-specific SWPPP approved by DOH, incorporating LID features into the projects, disposing properly of any impacted soils, placing a clean fill cap on top, and stormwater sampling. Projects in these locations would follow existing land use controls, including restricting the site to industrial/commercial use, no use for residential purposes, and no use for schools or childcare centers. Adherence to applicable BMPs and Standard Operating Procedures (SOPs) during construction would reduce the likelihood and volume of accidental releases, allow for accelerated spill response times, and enable timely implementation of cleanup measures, thereby minimizing potential impacts to the environment. Hazardous materials associated with construction activities would be delivered and stored in a manner that would prevent these materials from leaking, spilling, and potentially polluting soils, ground, and surface waters and in accordance with applicable federal, state, and local regulations. Public transportation routes would be utilized for the conveyance of hazardous materials to the construction site. Transportation of all materials would be conducted in compliance with U.S. Department of Transportation regulations.

Training with the modernized equipment would be similar to training with the legacy equipment being replaced. The modernized equipment types are based on the same platforms and would operate similarly to the legacy equipment they are replacing. The new equipment would not introduce any new hazardous materials to base operations at MCB Hawaii Kaneohe Bay and the Marine Corps training areas. Operations at MCB Hawaii Kaneohe Bay would include vehicle and equipment maintenance, would not change from current activities. Therefore, there would be no change to volume and type of fuel, oils, and lubricants used during operations and maintenance. All training with modernized equipment at the training areas would continue to be conducted in accordance with MCB Hawaii Order 1500.9C (MCB Hawaii, 2021a). This order has procedures for managing any release of hazardous materials used in training. For these reasons, hazardous materials and waste are not evaluated further in this EA.

Marine Biological Resources. The proposed action does not include in-water construction or training activities with modernized equipment. ESA-listed marine species with the potential to haul-out on the beaches of MCB Hawaii, MCTAB, and Pu‘uloa RTF are addressed in Section 3.5, *Terrestrial Biological Resources*. The proposed action does not change the potential for in-water impacts to marine species. For these reasons, in-water impacts to marine biological resources are not further analyzed in this EA.

Socioeconomics. The proposed action consists of modernization of equipment; infrastructure modifications on MCB Hawaii Kaneohe Bay; and associated training at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF. There would be no change in the number of Marine Corps Hawaii ground forces personnel because of the proposed action. As such, the proposed action would result in no changes to populations outside the base, with no corresponding impacts to employment or industry characteristics; demand for schools, housing, and recreational facilities; or changes to the demographic, economic, and fiscal environment of Kailua, Kāne‘ohe, Waimānalo, ‘Ewa Beach, and the County of Honolulu. Proposed construction may provide some minor, temporary beneficial impacts to the local economy from construction-related jobs and purchasing, but no long-term increase in employment would result. For these reasons, impacts to socioeconomics are not further analyzed in this EA.

Environmental Justice. In April 2023, the Biden Administration issued Executive Order (EO) 14096, *Revitalizing Our Nation’s Commitment to Environmental Justice for All* (2023). This EO created the Justice40 Initiative that will “further embed environmental justice into the work of federal agencies.” As part of this initiative, “over-burdened” communities are to be protected from pollution and

environmental harms. These communities are identified by census tract using the Climate & Economic Justice Screening Tool. With the exception of Kailua, most of the communities located near MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF have a higher percentage of minority race persons and about the same portion of persons in poverty as the greater county and state (U.S. Census Bureau, 2023). Kailua Census Designated Place has much lower minority and poverty population percentages than the county or state.

All proposed construction and training would be located on Marine Corps property, with the exception of vehicles transiting from MCB Hawaii Kaneohe Bay to two Marine Corps training areas over public roads. There would be no risk to public health and safety from proposed training conducted within existing training areas (see Section 3.6, *Public Health and Safety*). For vehicles transiting on public roadways, exposure and risk to the general public from the proposed action is minimal and consistent with the potential for vehicle accidents to occur on any public roadway (see Section 3.7, *Transportation*). In addition, as described further in Chapter 3, construction activities of the proposed action would result in less than significant impacts on the physical and natural environment to air quality, water resources, and biological resources. Consequently, proposed construction would not result in disproportionate adverse impacts to low-income or minority populations.

Regarding training, the proposed action would occur at existing training areas on MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF. The nearest residential community populations to MCB Hawaii Kaneohe Bay are Kāne'ohe to the south and southwest and Kailua to the south and southeast; for MCTAB, Waimānalo to the south and southeast, Kailua to the northwest, and Lanikai to the north; and for Pu'uloa RTF, 'Ewa Beach to the west and northwest and Iroquois Point to the east. Aside from transportation of equipment and personnel to the three training areas, all training with modernized equipment would be at the three Marine Corps training areas on O'ahu, similar to existing training with regard to type and tempo of training, and would not have adverse effects to populations in these areas (see resource-specific impact analyses later in this chapter). Consequently, proposed training would not result in disproportionate adverse human health or environmental impacts to low-income, minority populations, or over-burdened populations. For these reasons, environmental justice is not further analyzed in this EA.

Land Use. MCB Hawaii Kaneohe Bay is an existing military installation, and all proposed construction would occur within base boundaries and be consistent with the military mission. As explained in Section 2.1.3, the proposed training does not represent a different approach or impact different resource areas when compared to the training that currently occurs at these locations. The modernized equipment and training does not change any types of land uses or public activities conducted in and around these locations. Therefore, no new land uses would result from the proposed action, thus land use is not evaluated further in this EA.

Recreation. Proposed construction and training would occur entirely on Marine Corps property. Public access is not allowed at MCB Hawaii Kaneohe Bay or at Pu'uloa RTF, and public access is limited at MCTAB to weekends when training is not occurring. The proposed action does not change these restrictions or impact public access to MCTAB, thus recreation is not evaluated further in this EA.

Infrastructure and Utilities Systems. None of the proposed construction projects or training would require significant alterations or upgrades to the existing utilities and infrastructure system capacity. Water, sewer, and electrical utilities would be improved, as necessary, within the proposed construction footprints. Proposed construction and training would not increase the demand for the utilities systems. Increased training tempo under Alternative 2 would increase fuel usage for modernized equipment but

would not alter the utilities demand generated at any of the Marine Corps training areas. Electrical power, potable water, wastewater, solid waste, stormwater, and information technology/ communications infrastructure and capacity would be adjusted based on new construction, but the proposed action does not represent a meaningful capacity increase in any of these systems. For these reasons, infrastructure and utilities are not evaluated further in this EA.

3.1 Noise

Noise is generally defined as unwanted sound. From a physical standpoint, there is no distinction between noise and desired sound, as both consist of vibrations through air. The distinction arises from the brain's perception of the sound as wanted, expected or pleasant, as opposed to "noise," which is perceived as unpleasant, loud, or disruptive to hearing. Noise may be intermittent or continuous, steady or impulsive, and stationary or transient. Common noise-sensitive public receptors include schools, residential areas, and recreational areas. This section applies to human receptors; impacts to wildlife are addressed in Section 3.5, *Terrestrial Biological Resources*.

The physical characteristics of noise include its intensity, frequency, and duration. The large variation in sound intensities affecting humans range from a soft whisper to a jet engine resulting in sound levels typically presented using a logarithmic scale. The unit used to measure the intensity of sound is the decibel (dB) and human hearing ranges up to 120 dB, at which point sound causes physical discomfort. The frequency of sound is measured in cycles per second, or hertz. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound levels are further refined using frequency "weighting." The human ear is most sensitive to frequencies in the 1,000 to 4,000 hertz range. Sound meters calibrated to emphasize frequencies in this range and de-emphasize very low or very high frequencies are termed "A-weighted," and sound is identified in terms of A-weighted decibels (dBA). Unless otherwise stated in the EA, dB units refer to dBA-weighted sound levels. At approximately 3 feet, sound from normal human speech ranges from 63 to 65 dBA, operating kitchen appliances range from 83 to 88 dBA, and rock bands approach 110 dBA (Cowan, 1994).

The day-night average sound level (DNL) represents the primary noise metric utilized by both DoD and the Federal Aviation Administration (FAA) for assessing environmental noise, which is the sound level measured over a 24-hour period, with a 10 dB adjustment assigned to noise events occurring between 10 p.m. and 7 a.m. (often referred to as "DNL nighttime") (DoD, 2020; FAA, 2020). The adjustment accounts for the added intrusiveness of noise events affecting people during the DNL nighttime period. Most people are routinely exposed to sound levels of 50 to 55 DNL or higher (Federal Interagency Committee on Urban Noise, 1980). Both the DoD and FAA have adopted 65 dBA DNL as the threshold for potential land use incompatibility (DoD, 2021). Areas exposed to less than 65 dB DNL are considered compatible for all land uses.

3.1.1 Affected Environment

3.1.1.1 MCB Hawaii Kaneohe Bay

The predominant noise sources at MCB Hawaii Kaneohe Bay are the aircraft using the airfield, training activities at installation ranges, and vehicle traffic on base roadways. Community and school locations around MCB Hawaii Kaneohe Bay currently experience an average noise level of 41 to 43 dB DNL from aircraft activities, well under the 65 dB DNL compatibility level (Marine Corps, 2022).

Training areas at the base are within base boundaries. The ranges within the Ulupaʻu Crater of Kāneʻohe Bay provide live-fire training, including military small arms, .50 caliber, 60mm mortars, rockets, and explosives training up to 12.5 pounds Net Explosives Weight. Training at the MOUT site at Pyramid Rock in the northwest portion of the base consists of non-live-fire urban training with use of small explosive charges. On the eastern portion of the base, the Boondocker LZ training area located in the southeastern side of Kāneʻohe Bay (as shown in Figures 1-2 and 2-1) supports non-live-fire MOUT and Helicopter Rope Suspension Techniques training, and LZ Eagle (adjacent to Fort Hase Beach) provides

basic aviation training. In addition to the natural land features buffering the training areas, these training activities are between 0.5 and 2 miles away from the public.

Table 3.1-1 lists the approximate distances to nearby communities from the closest portion of each training area. For MCB Kaneohe Bay, the nearest population to training is Kailua, located 0.5 mile south of Boondocker LZ.

Table 3.1-1 Distances from Training Areas to Nearest Communities

Training Area	*Nearest Distance*	*Community*
MCB Hawaii Kaneohe Bay		
Boondocker LZ	0.5 mile	Kailua
Fort Hase Beach	0.8 mile	Kailua
Ulupaʻu Crater	2 miles	Kailua
Pyramid Rock	2 miles	Kāneʻohe
Pyramid Rock	3 miles	Heeia
MCTAB		
Southernmost LZs	0.1 mile	Waimānalo
MOUT Training Areas	0.1 mile	Kailua
MOUT Training Areas	0.3 mile	Lanikai
Puʻuloa RTF		
Southwestern portion	Adjacent	ʻEwa Beach Park
Southwestern portion	0.06 mile (320 feet)	ʻEwa Beach (along beach)
Eastern portion	0.1 mile	Iroquois Point
Eastern portion	0.3 mile	Iroquois Point Elementary School
Western portion	0.6 mile	ʻEwa Beach (inland)
Northwestern portion	0.8 mile	ʻEwa Beach Country Club golf course

Notes: Distances are approximate from nearest portion of training area to nearest portion of community.
Legend: LZ = Landing Zone; MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; MOUT = Military Operations Urban Training; RTF = Range Training Facility.

Ground-based training with cannon sections and mobile radar equipment currently occurs approximately 650 times per year throughout the training areas at MCB Hawaii Kaneohe Bay. This is the approximate equivalent of between one and two times per day on average. The largest vehicles used for current ground-based training are the 7-ton trucks used to support cannon section training. At 50 feet, trucks of equivalent size (e.g., construction trucks) generate a noise level of 82 dB, decreasing to approximately 54 dB at 500 feet, resulting in noise levels typical of rural communities. Consequently, received noise levels in the local community, which is a minimum of 0.05 mile away from current ground-based training, are compatible with the existing noise environment (Marine Corps, 2022).

3.1.1.2 MCTAB

The main noise sources at MCTAB are vehicles, amphibious vehicles, rotary-wing aircraft, simulated explosives, and blank gunfire used during military training. Military vehicle activities occur throughout MCTAB on roadways and designated paths, including cannon sections and radar systems. The beaches at MCTAB are used for amphibious training comprised of amphibious vehicles transiting between the waterline and the fenced area via established vehicle pathways. MCTAB is used for approximately 350 landing events per year for rotary-wing (helicopters) and tilt-rotor (MV-22s) aircraft. Additionally, existing training uses simulate explosives and blank fire. Most of these activities occur during daylight hours, with only approximately 4% occurring after 10 p.m. (Marine Corps, 2012).

With the exception of aviation and amphibious vehicle training, ambient noise levels in this area average hourly equivalent sound levels of 54 dB during daytime hours (7 a.m.–10 p.m.) and 45 dB during nighttime hours (10 p.m.–7 a.m.) (Navy, 2018). Aviation and amphibious training includes five LZs for rotary-wing aircraft, drop zones (for personnel and equipment being airdropped via parachute from aircraft), and low-level flight training (rotary-wing aircraft). The MV-22 generates single event noise levels at ground level of up to 99 dB under the downwind portion of the aircraft's flight path while operating at 300 feet above the ground (Marine Corps, 2012).

Ground-based training occurs approximately 620 times per year at MCTAB, or on average between 1 to 2 times per day. This involves convoys of vehicles, equipment, and personnel traveling from MCB Hawaii Kaneohe Bay to the MCTAB training areas (see Section 3.7, *Transportation*). These convoys are along existing roadways and produce noise consistent with typical civilian roadway noise. Ground-based training currently occurs within MCTAB's boundaries greater than 500 feet from the boundaries of the training area.

Military training at MCTAB occurs primarily on weekdays, and the public is not allowed onto MCTAB while training occurs. The beaches are typically available to civilian camping and recreational use on the weekends and on weekdays when not being used for training. The nearest residential community populations to portions of MCTAB are Waimānalo 0.1 mile (about 500 feet) to the south and southeast, Kailua 0.1 mile to the northwest, and Lanikai 0.3 mile to the north (see Table 3.1-1). Noise from military training at MCTAB is separated from these communities by intervening terrain, thick vegetation, and vehicle traffic along Kalaniana'ole Highway. As such, noise levels in the local community from current ground-based training are less than 54 dB and are compatible with the existing noise environment.

3.1.1.3 Pu'uloa RTF

The main noise sources at Pu'uloa RTF audible to the surrounding communities are small-weapons firing (rifles and pistols), use of loudspeakers to ensure range safety, aircraft activity associated with Daniel K. Inouye International Airport and Joint Base Pearl Harbor-Hickam airfield, and infrequent amphibious vehicle activities that occur during special event training. Noise from small-weapons firing and use of the loudspeakers are audible in communities in adjacent areas. The State of Hawai'i Department of Transportation (HDOT) has noise exposure maps that identify noise exposure contours from aircraft traffic associated with Daniel K. Inouye International Airport. The 55 dB noise contour intersects the northern portion of Pu'uloa RTF and the shoreline area, including the adjacent residential areas (MCB Hawaii, 2019).

Ground-based training, which consists mostly of small arms qualification and training, occurs approximately 180 times per year within Pu'uloa RTF boundaries, or on average approximately once every 2 days. Ground-based training with legacy equipment involves convoys of vehicles, equipment, and personnel from MCB Hawaii Kaneohe Bay to Pu'uloa RTF (see Section 3.7, *Transportation*). These convoys are along existing roadways and generate noise consistent with typical civilian roadway noise.

The nearest residential community populations are a small cluster of homes in 'Ewa Beach within 300 feet of the southwest corner of Pu'uloa RTF, Iroquois Point approximately 500 feet to the east, and 'Ewa Beach 320 feet to the west and northwest (see Table 3.1-1). 'Ewa Beach Park is immediately adjacent to Pu'uloa RTF to the west. Iroquois Point Elementary School is located 0.3 mile to the northeast. Noise from training at Pu'uloa RTF is affected by overflight of inbound commercial aircraft, the ocean, and high berms on the ranges. There is also a 300-foot buffer to the east and west between the ranges and housing. The 'Ewa Beach community, approximately 0.6 mile to the northwest, is separated from

Pu‘uloa RTF by intervening trees and the ‘Ewa Beach Country Club golf course. There is no public access to the beach adjacent to Pu‘uloa RTF, but the public does use public and private beaches to the east and west of Pu‘uloa RTF property lines.

Areas outside of Pu‘uloa RTF typically experience aircraft noise but at levels that are considered compatible for all land uses and below 65 dB DNL (MCB Hawaii, 2019). Current ground-based training at Pu‘uloa RTF that occurs in the southwestern portion of the training area can potentially be 320 feet to the nearest community. At 50 feet, trucks of equivalent size (e.g., construction trucks) generate a noise level of 82 dB; at 300 feet, this level decreases to approximately 60 dB. Although higher than the estimate at 500 feet distance, this resulting noise level is also compatible with the existing land use surrounding the facility.

3.1.2 Environmental Consequences

3.1.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur and there would be no change to noise.

3.1.2.2 Facilities Alternatives

Preferred Facilities Locations

Construction would result in short-term, intermittent noise impacts from the operation of heavy equipment, power and hand tools, and construction vehicles in discrete areas on MCB Hawaii Kaneohe Bay. Construction equipment operation would occur sporadically throughout daytime hours. Noise would also be generated by trucks delivering materials to the construction site and construction worker vehicles. There are no sensitive human receptors, such as schools or day care centers, within the proposed construction footprint and all construction would occur in operational areas on MCB Hawaii Kaneohe Bay, which are already subject to industrial and aircraft noise. Base housing north of Mōkapu Road would be the nearest on-base noise sensitive receptor, which would be approximately 200 feet north of the proposed consolidated Paraloft and Dive Shop and 3d Radio Battalion Boat Shop shown in Figures 2-1 and 2-2. Mōkapu Elementary School is not near any of the proposed construction locations. All construction would be consistent with existing noise onboard MCB Hawaii Kaneohe Bay. Hawai‘i Administrative Rule (HAR) Chapter 11-46, *Community Noise Control*, specifies acceptable noise levels for Class A zoning district (equivalent to lands zoned for residential, conservation, or public space) to be 55 dBA during hours of 7 a.m. to 10 p.m. (DOH, 1969). It states that “[n]oise levels shall not exceed the maximum permissible sound level for more than ten percent of the time within any twenty minute period, except by permit or variance.” At 50 feet, the loudest construction equipment (a bulldozer) would generate a noise level of 82 dB, at 500 feet this level would decrease to approximately 54 dB resulting in noise levels that would be compatible with the existing noise environment. Therefore, a construction noise permit or variance under HAR Chapter 11-46 would not be required. The proposed construction project nearest to the local community in the southeastern portion of the base is 0.6 mile from the closest residence. Received noise levels in the local community would be less than 54 dB and would be compatible with the existing noise environment. For these reasons, the preferred facilities locations would have less than significant noise impacts.

Alternate Facilities Locations

Under this alternative, alternate facilities locations would primarily involve reuse and renovation of existing facilities, and there would be minimal construction. The only construction that would occur would be for Project 2 near Building 6468 and Project 3 at the 1/2 Gun Park. These locations are in developed areas of the base and are the same general distances from sensitive noise receptors as the preferred facilities construction locations described above. The type of noise effects during construction would be identical, but the construction period would be shorter. As a result of its reduced minimal construction, the noise for alternative facilities would be less than the preferred alternative. As such, like the preferred alternative, the alternate facilities locations would have less than significant noise impacts.

3.1.2.3 Operational Alternatives

Alternative 1

MCB Hawaii Kaneohe Bay

As described in Section 2.1.3, training associated with the modernized equipment at MCB Hawaii Kaneohe Bay is consistent in type and tempo with existing training at the range, including movement of vehicles from support facilities on the installation to various training locations on the installation. This would occur approximately 650 times per year under Alternative 1, which is identical to the amount of training that currently occurs. Vehicle noise would occur along the roadways and established vehicle paths at the training areas. The types of vehicles associated with the modernized equipment are similar to vehicles currently used for training. Modernized equipment would be generally the same size or smaller than the legacy equipment it is replacing. For example, the JLTV would replace the current larger 7-ton truck for NMESIS training, the MADIS and L-MADIS vehicles would replace the larger UTV, and the G/ATOR would be transported via the MTVR and HMMWV, as well as continued use of 7-ton trucks. The Marine Corps in Hawai‘i already regularly use the JLTV, MTVR, and HMMWV in training. The engine types and sizes for the modernized equipment are similar in type and operational characteristics to existing legacy equipment and the vehicles associated with modernized equipment are the same size or smaller than legacy equipment. For reference, the existing HMMWV produces noise levels that are below 85 dB at low to medium speeds and can be over 100 dBA at top speed for some models (U.S. Army Center for Health Promotion and Preventative Medicine Hearing Conservation Program, 2006). In contrast, the JLTV generates noise levels varying from 72 to 91 dB at 100 feet, with the greatest noise levels occurring during high-speed acceleration (Marine Corps, 2021). Although the exact conditions under which the two vehicles were measured may differ, given the similarity in size and engine displacement and the available data, noise levels generated from modernized equipment would likely be similar or slightly quieter than legacy equipment while operating at the proposed training areas.

Training with the modernized equipment would occur in the same locations and be of the same type and tempo as current ground-based training. Given the similarity of the equipment and the training and tempo (Section 2.2.1), there would be no significant change to the type and amount of noise generated by the vehicles or training activities for individual training events from existing conditions. As described above for MCB Hawaii Kaneohe Bay training areas, noise levels in the local community from current ground-based training are less than 54 dB and are compatible with the existing noise environment. Due to the similar vehicle/equipment characteristics and exact same locations for training, noise levels under Alternative 1 would be similar for training with legacy equipment. Community populations are 0.8 mile away at the closest training location (Fort Hase Beach) and notably farther away from other training

locations such as Ulupaʻu Crater and Pyramid Rock (see Table 3.1-1). In addition, no live-fire training would occur with the modernized equipment. Consequently, proposed training with modernized equipment would not alter the noise environment at or surrounding MCB Hawaii Kaneohe Bay.

MCTAB

Modernized equipment training would involve movement of vehicles from support facilities at MCB Hawaii Kaneohe Bay to MCTAB. This would occur approximately 620 times per year under Alternative 1, which is identical to the amount of ground-based training that currently occurs there. As described for MCB Hawaii Kaneohe Bay, the modernized equipment would generate similar noise levels as current equipment, so equipment noise from individual training activities would not noticeably change over existing conditions. Moreover, again as identified for MCB Hawaii Kaneohe Bay and in Section 2.2.1, the type and tempo of the training is similar to existing training with legacy equipment. Lastly, vehicle noise onboard MCTAB is lower than the predominant noise sources from military training at MCTAB, which are aircraft hovering and landing events that occur throughout the year. As described above for MCTAB training areas (Section 3.1.1.2), noise levels in the local community from current ground-based training are less than 54 dB and are compatible with the existing noise environment. Therefore, proposed training with modernized equipment would not alter the existing noise environment at or surrounding MCTAB.

Puʻuloa RTF

Like with MCTAB, modernized equipment training would involve movement of vehicles from support facilities at MCB Hawaii Kaneohe Bay to Puʻuloa RTF. This would occur approximately 180 times per year under Alternative 1, which is identical to the amount of small weapons' qualification and training that currently occurs there. The analysis of vehicle noise and training activities for MCTAB is equally applicable for Puʻuloa RTF, resulting in noise not significantly different from existing conditions. Vehicle noise generated during training with modernized equipment at Puʻuloa RTF would not be above 54 dB in any noise sensitive areas. The nearest public receptor is ʻEwa Beach Park adjacent to the range, and the nearest residents would be 320 feet and 0.2 mile to Iroquois Point and ʻEwa Beach, respectively. Lastly, vehicle noise levels would be lower than the predominant noise source from military training at Puʻuloa RTF, which is live-fire small weapons training that occurs on weekdays throughout the year. Noise levels in the local community from training with modernized equipment would continue to be at or less than 54 dB and, therefore, would be indistinguishable from the existing noise environment. Therefore, proposed training with modernized equipment would not alter the dominant source of noise in the existing noise environment at or surrounding Puʻuloa RTF.

For these reasons, Alternative 1 training would have less than significant impacts to noise.

Alternative 2

Alternative 2 would have a 20% increase in the number of training events annually with the modernized equipment. Under Alternative 2, this results in an increase over Alternative 1 of approximately 130 events per year for MCB Hawaii Kaneohe Bay, 125 per year for MCTAB, and 35 per year for Puʻuloa RTF. This would amount to an average increase of three training events per week for MCB Hawaii Kaneohe Bay and MCTAB and an increase of once every week for Puʻuloa RTF. The increased training would occur in areas that experience multiple types of training on a regular basis throughout the year.

Although the noise levels from specific modernized equipment training events would not change, the 20% increase in the frequency of training events would equate to an increase in military-generated

noise of less than 1 dB DNL. This relatively small change to DNL is considered less than significant to the overall noise environment. The largest vehicles used for current ground-based training are the 7-ton trucks used to support cannon section training. Consistent with Alternative 1, JLTVs associated with modernized NMESIS equipment are smaller and generate exterior noise levels that are consistent with current systems. Therefore, the perceived noise in communities adjacent to the training areas for individual training events would be indistinguishable from the existing noise environment. As described above, noise levels generated are assumed to be the same or slightly less for modernized equipment when compared with legacy equipment, and the type of training would be similar. Therefore, noise levels in the local community from training with modernized equipment generate similar single-event noise levels as existing activity that would remain well below the threshold at which noise sensitive land uses are considered incompatible. As described above, the slight increase in training would not generate noise levels that would be noticeable to community members in the area. Therefore, the increase in the number of noise events by 20% would not adversely affect local communities. For these reasons, Alternative 2 training would have less than significant impacts to noise.

3.2 Air Quality

This discussion of air quality includes criteria pollutants, standards, sources, permitting, and greenhouse gases (GHGs). The concentration of various pollutants in the atmosphere defines the air quality in a region or at a specific location. Many factors influence a region's air quality, including the type and quantity of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.

Most air pollutants originate from human-made sources, including mobile sources (e.g., aircraft, cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents). Natural sources, such as volcanic eruptions and forest fires, also release pollutants into the air.

3.2.1 Affected Environment

The affected environment for air quality consists of the island of O'ahu generally but expands to include the state of Hawai'i when GHGs and climate change effects are considered. Air quality in the state of Hawai'i can be generally characterized as relatively clean and low in pollution. Data from DOH air quality monitoring stations indicate the state is in attainment of all National Ambient Air Quality Standards (NAAQS), with the exception of exceedances for sulfur dioxide (SO_2) and particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$) in communities near the volcano on Hawai'i Island, which is considered by the USEPA as a natural, uncontrollable event (DOH, 2022). According to the USEPA Green Book, all counties within the state of Hawai'i are in attainment (USEPA, 2023). Because the state is in attainment of the NAAQS, it is not subject to the General Conformity Rule under the Clean Air Act.

On O'ahu, the prevailing trade winds come from the northeast throughout the year. Figure 3.2-1 shows a wind rose for data collected from 2014 to 2018 by the weather station (PHNL) located at Daniel K. Inouye International Airport in Honolulu. The wind rose shows which direction the winds blow from towards the center point, and the length of each color indicates how often the wind blows from that direction and the wind speed. The slowest winds (mostly in yellow) are closest to the center of the diagram.

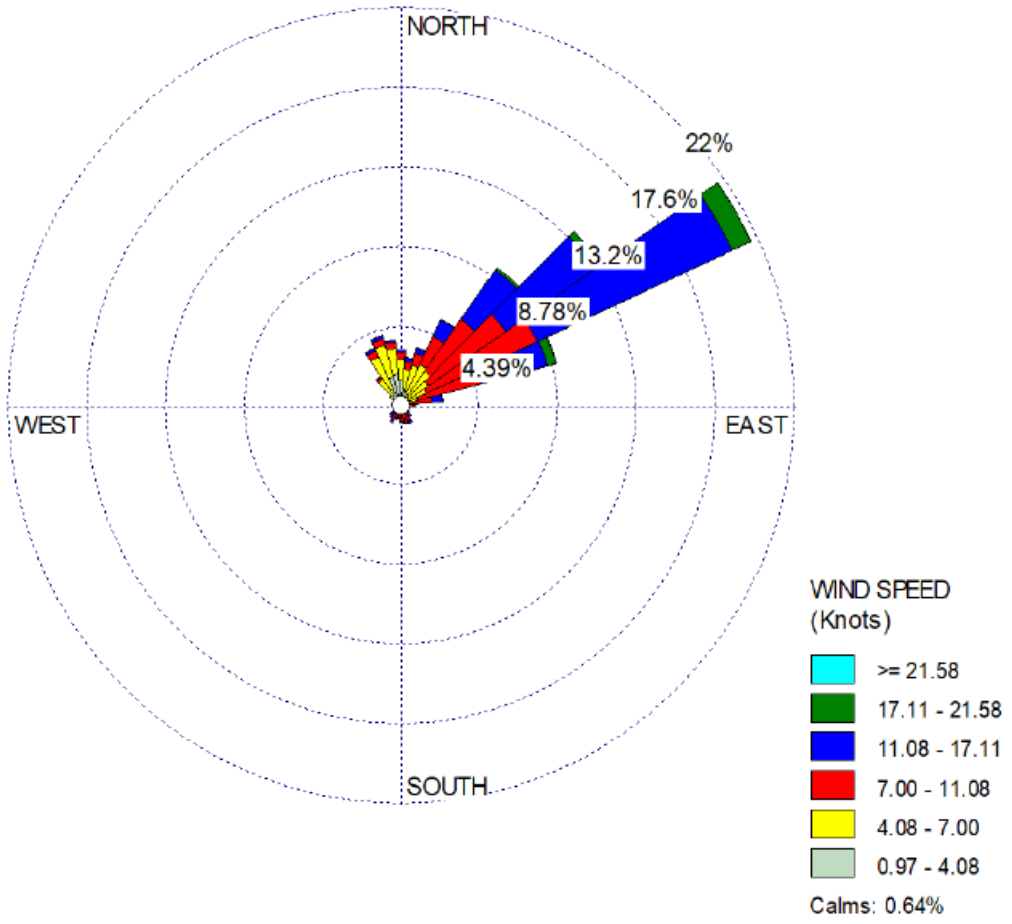


Figure 3.2-1 Wind Rose, Honolulu 5-year (2014–2018) Hourly Winds

MCB Hawaii Kaneohe Bay is located on the east side of the island. Emission sources at MCB Hawaii Kaneohe Bay generally include fuel combustion by aircraft engines and motor vehicles, and facility boilers and generators. A corrosion control hangar operates under a DOH Clean Air Branch "non-covered" (i.e., minor) emissions permit (Naval Facilities Engineering Systems Command [NAVFAC] Pacific, 2018).

Emission sources in operation at MCTAB and Pu'uloa RTF generally include fuel combustion from aircraft, ground vehicles, amphibious vehicles, and vehicle convoys from MCB Hawaii Kaneohe Bay. Baseline operational emissions from military vehicles transporting equipment and personnel to both off-base locations for training were calculated based on the total annual miles traveled in a typical year and are shown in Table 3.2-1.

Table 3.2-1 Annual Baseline Estimated Emissions for Vehicle Travel to Training Areas

Scenario	*VOC (tons)*	*CO (tons)*	*NO_x (tons)*	*SO_2 (tons)*	*PM_{10} (tons)*	*$PM_{2.5}$ (tons)*	*CO_2 (metric tons)*
Baseline: vehicle travel to off-base training areas	0.01	0.08	0.14	0.00	0.06	0.01	39

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

3.2.2 Environmental Consequences

To evaluate potential impacts to air quality, emissions were estimated for both construction and training associated with modernized equipment under the proposed action. Construction activities evaluated the use of construction equipment and other fuel-burning sources as the primary emission sources. Fugitive dust emissions from earth disturbance during construction were estimated based on the areas with potential ground disturbance and emissions factors from USEPA AP-42, *Compilation of Air Pollutant Emissions Factors*. Emissions factors, assumptions, and calculations are provided in Appendix F.

The training activities are evaluated through any changes in emissions from either stationary or mobile sources resulting from the proposed action. This evaluation assumes all equipment would be diesel-powered. Estimates of equipment emissions were based on the estimated hours of usage and emission factors for each anticipated mobile source. This analysis evaluated nitrogen oxides (NO_x), volatile organic compound (VOC), carbon monoxide (CO), carbon dioxide (CO_2), particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), $PM_{2.5}$, and SO_2 related to heavy-duty diesel equipment and on road trucks and commuter vehicles.

Air quality impacts within the affected environment were reviewed relative to federal, state, and local air pollution standards and regulations. Since the state of Hawai‘i is in attainment of the NAAQS for all criteria pollutants, this air quality analysis uses the USEPA’s Prevention of Significant Deterioration stationary source permitting threshold of 250 tons per year as an indicator of the local significance of potential impacts to air quality.

3.2.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur and there would be no change to air quality.

3.2.2.2 Facilities Alternatives

Preferred Facilities Locations

Construction activities during implementation of Alternative 1 would generate short-term, temporary air emissions such as fugitive dust and combustion of fossil fuels from construction equipment and contractor vehicles. Proposed construction and demolition activities would primarily occur on the eastern part of MCB Hawaii Kaneohe Bay. The proposed construction activities would occur over 8 years.

This analysis looked at VOCs, CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$, and CO_2 related to heavy-duty diesel equipment and on-road trucks and contractor vehicles using the USEPA’s Motor Vehicle Emission Simulator emission factor model. The earth disturbance-related fugitive dust emissions were estimated based on

the areas with potential ground disturbance using USEPA AP-42 PM emission factors. Table 3.2-2 summarizes the estimated annual construction emissions under Alternative 1.

Table 3.2-2 Estimated Air Emissions from Construction under Preferred Facilities Locations

Year	*VOC (tons)*	*CO (tons)*	*NO_x (tons)*	*SO_2 (tons)*	*PM_{10} (tons)*	*$PM_{2.5}$ (tons)*	*CO_2 (metric tons)*
Year 1	0.73	3.82	11.62	0.13	2.84	0.83	1,086
Year 2	0.59	3.28	10.09	0.10	1.19	0.59	936
Year 3	0.41	2.26	7.82	0.05	0.61	0.40	707
Year 4	0.41	2.24	7.79	0.05	0.63	0.40	704
Year 5	0.42	2.28	7.92	0.05	0.68	0.42	717
Year 6	0.41	2.27	7.84	0.05	0.58	0.39	710
Year 7	0.42	2.29	7.94	0.05	0.84	0.42	719
Year 8	0.40	2.22	7.71	0.05	0.46	0.38	697
Comparative Threshold	250	250	250	250	250	250	N/A
Exceeds Threshold?	No	No	No	No	No	No	N/A

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; N/A = not applicable; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Proposed construction would result in short-term, intermittent air quality impacts on MCB Hawaii Kaneohe Bay due to the operation of construction equipment and contractor vehicles. Site grading would result in localized increases in particulate matter. All construction-related emissions would be well below the comparative threshold levels (see Table 3.2-2), and thus do not significantly deteriorate the attainment areas of Hawai'i and O'ahu. All construction activities would comply with the provisions of HAR 11-60.1-33, *Fugitive Dust*, and employ dust management BMPs such as regular watering, to ensure compliance with regulatory limits. The distance to the closest downwind sensitive receptors is approximately 0.57 mile to the nearest off-base residential area from any of the proposed construction locations. In summary, because construction air emissions would be temporary in nature, over one-half mile from any sensitive receptor, and would utilize HAR mandatory construction BMPs, the preferred facilities locations would have less than significant impacts to air quality.

Impacts due to GHG emissions are analyzed in Section 4.4, *Cumulative Impact Analysis*.

Alternate Facilities Locations

Table 3.2-3 summarizes the estimated annual construction emissions under the alternate facilities locations.

Table 3.2-3 Estimated Air Emissions from Construction under Alternate Facilities Locations

Year	*VOC (tons)*	*CO (tons)*	*NO_x (tons)*	*SO_2 (tons)*	*PM_{10} (tons)*	*$PM_{2.5}$ (tons)*	*CO_2 (metric tons)*
Year 1	0.22	1.26	3.33	0.05	0.52	0.23	320
Year 2	0.22	1.23	3.20	0.05	0.29	0.20	307
Year 3	0.21	1.20	3.13	0.05	0.22	0.19	301
Year 4	0.21	1.19	3.10	0.05	0.22	0.18	298
Year 5	0.21	1.21	3.14	0.05	0.11	0.19	302
Year 6	0.21	1.21	3.15	0.05	0.22	0.19	303
Year 7	0.21	1.21	3.15	0.05	0.25	0.19	303
Year 8	0.21	1.19	3.09	0.05	0.20	0.18	297
Comparative Threshold	250	250	250	250	250	250	N/A
Exceeds Threshold?	No	No	No	No	No	No	N/A

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; N/A = not applicable; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Under this alternative, alternate facilities locations would primarily involve reuse and renovation of existing facilities with minimal construction. The only construction that would occur would be for Projects 2 and 3, which would involve the renovation, demolition, and construction of new buildings. The magnitude of construction activities would be less than for the preferred facilities. Like with the preferred alternative, air emissions would be temporary in nature, the distance to the closest downwind sensitive receptors is approximately 0.57 mile, and the proposed construction would adhere to HAR requirements for managing fugitive dust, resulting in the alternate facilities locations having less than significant impacts to air quality.

3.2.2.3 Operational Alternatives

Alternative 1

As noted previously in the EA, the modernized equipment would have similar operational characteristics to those used historically. This includes the JLTV replacing the larger 7-ton truck, the MADIS and L-MADIS vehicles replacing the larger UTV, and the G/ATOR consolidating several systems into a single system and being transported via the MTVR and HMMWV. The Marine Corps in Hawai‘i already commonly use the JLTV, MTVR, and HMMWV. In addition, training with the modernized equipment would occur in the same locations and be of the same type, and, under Alternative 1, consist of the same tempo as current ground-based training, with no change in miles traveled by vehicles transporting personnel and equipment between MCB Hawaii Kaneohe Bay and the two off-base training areas. Table 3.2-4 presents training emissions of Alternative 1 and the change from existing training emissions. Emissions would remain similar to or slightly reduced under Alternative 1 compared to baseline conditions for criteria pollutants. As shown in Table 3.2-4, emissions would not exceed the regulatory threshold for any criteria pollutant and therefore, Alternative 1 training would have less than significant impacts to air quality.

Table 3.2-4 Net Change in Annual Estimated Emissions under Alternative 1

Scenario	*VOC (tons)*	*CO (tons)*	*NO_x (tons)*	*SO_2 (tons)*	*PM_{10} (tons)*	*$PM_{2.5}$ (tons)*	*CO_2 (metric tons)*
Baseline: vehicle travel to off-base training areas	0.01	0.08	0.14	0.00	0.06	0.01	39
Alternative 1: vehicle travel to off-base training areas	0.02	0.05	0.16	0.00	0.00	0.00	16
Net change in annual emissions	0.01	-0.03	-0.01	0.00	-0.06	-0.01	-23
Comparative Threshold	250	250	250	250	250	250	N/A
Exceeds Threshold?	No	No	No	No	No	No	N/A

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; N/A = not applicable; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Impacts due to GHG emissions are analyzed in Section 4.4, *Cumulative Impact Analysis*.

Alternative 2

As described in Section 3.1, *Noise*, operation of modernized equipment under Alternative 2 would be the same as described for Alternative 1, but there would be a 20% increase in training tempo. This would result in a change in the total annual miles driven by vehicles to move personnel and equipment from MCB Hawaii Kaneohe Bay to conduct training. Table 3.2-5 shows the estimated emissions under Alternative 2 when compared to baseline scenario.

Table 3.2-5 Net Change in Annual Estimated Emissions under Alternative 2

Scenario	*VOC (tons)*	*CO (tons)*	*NO_x (tons)*	*SO_2 (tons)*	*PM_{10} (tons)*	*$PM_{2.5}$ (tons)*	*CO_2 (metric tons)*
Baseline: vehicle travel to off-base training areas	0.01	0.08	0.14	0.00	0.06	0.01	39
Alternative 2: vehicle travel to off-base training areas	0.02	0.06	0.19	0.00	0.00	0.00	19
Net change in annual emissions	0.01	-0.02	0.05	0.00	-0.06	-0.01	-20
Comparative Threshold	250	250	250	250	250	250	N/A
Exceeds Threshold?	No	No	No	No	No	No	N/A

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; N/A = not applicable; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

As with the preferred alternative, while estimated emissions for VOCs, CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$, and CO_2 would increase slightly under Alternative 2 compared to Alternative 1, emissions remain well below threshold levels. As such, Alternative 2 training, while resulting in slightly more emissions, would still have less than significant impacts to air quality.

3.3 Water Resources

Water resources include marine waters, groundwater, surface water, wetlands, floodplains, and drainages. This section identifies the existing condition of water resources and analyzes the impacts of the proposed action on those resources. The affected environment for water resources consists of the construction footprint at MCB Hawaii Kaneohe Bay; the training areas at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF; and the immediately adjacent areas.

3.3.1 Affected Environment

A description of water resources is presented below for MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF. Current training adheres to MCB Hawaii Order 1500.9C (see Section 2.1.3.2) requirements to protect water resources. These restrictions include prohibitions on disposing of oil, fuel, or hazardous materials onto the ground or water and use of detergents or chemicals for cleaning/maintaining vehicles and equipment. MCB Hawaii Order 1500.9C also requires training units to avoid wetlands at MCB Hawaii Kaneohe Bay and Waimānalo Stream at MCTAB. Because construction is proposed at MCB Hawaii Kaneohe Bay, the description of the affected environment for that location contains floodplain data.

3.3.1.1 MCB Hawaii Kaneohe Bay

Marine Waters

HAR 11-54, *Water Standards*, classifies Kāne'ohe Bay as marine water quality Class AA (DOH, 2021). Fresh water enters this portion of Kāne'ohe Bay from rainfall, intermittent small streams, and surface drainage from MCB Hawaii Kaneohe Bay. Water in this shallow area mixes slowly with deeper waters of the bay (Kāne'ohe Bay Information System, 2022). Freshwater mixing within the bay occurs more in the winter; during the summer, fresh water remains at the surface.

Groundwater

Groundwater results from the infiltration of water through surface soils and permeable rock materials. The Mōkapu Peninsula's thin layer of surface soil, combined with its layer of rock and sediments, provide little depth for groundwater drainage. Groundwater resources at Mōkapu Peninsula consist of an unconfined, low salinity caprock aquifer above a confined, freshwater basalt aquifer. There are no potable water wells on the base because the peninsula sits atop an area of brackish basal groundwater (Marine Corps, 2022).

Surface Water

Surface water resources generally consist of ponds, lakes, rivers, and streams. The affected area is located within the Koolau Poko watershed (a 65-square mile watershed subdivided into 19 sub-watersheds) and specifically within the Pu'u Hawai'iloa sub-watershed. Rainfall averages 40 inches per year (Rainfall Atlas of Hawai'i, 2023). There are no freshwater surface waters in the affected area. The Nu'upia Ponds Complex is an estuarine system near proposed construction, and Project 8 is immediately adjacent to Kāne'ohe Bay (see Figure 2-1). The affected area near the ponds complex collects and directs stormwater runoff from inland areas of Mōkapu Peninsula south to the Nu'upia Ponds Complex, ultimately connecting to Kāne'ohe Bay.

Wetlands

Wetlands are defined by the USEPA and U.S. Army Corps of Engineers as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include "swamps, marshes, bogs and similar areas." Eight protected wetland complexes are located at MCB Hawaii Kaneohe Bay: (1) Hale Koa Wetland; (2) Sag Harbor Wetland; (3) Salvage Yard Wetland; (4) Percolation Ditch Wetland; (5) Motor Pool Wetland; (6) Kāneʻohe Klipper Golf Course Ponds; (7) Temporary Lodging Facility Wetland; and (8) Nuʻupia Ponds Complex, a designated and protected Wildlife Management Area containing endangered flora and fauna. There are no wetlands located within the affected area; however, the Percolation Ditch Wetland and Motor Pool Wetland are adjacent to some of the proposed facilities' construction and renovation (see Figures 2-1 and 3.3-1). Ground-based training currently conducted at MCB Hawaii Kaneohe Bay adheres to MCB Hawaii Order 1500.9C, which specifically prohibits entering designated wetlands at MCB Hawaii Kaneohe Bay.

Floodplains

There are two types of flood-designated areas at MCB Hawaii Kaneohe Bay: flood zones designated by FEMA and shown in Flood Insurance Rate Maps, and floodplains specific to the Mōkapu Central Drainage Channel. The affected area is in FEMA Zone D, an area where flood hazards are possible, but undetermined (Figure 3.3-1). Coastal regions adjacent to the affected area to the west and north are in FEMA Zones VE (1% or greater annual chance of coastal flooding and an additional hazard of storm waves), and AE (1% annual chance of flooding). Portions of the affected area are within the Extreme Tsunami Evacuation Zone.

Box culverts drain the runway area southward to Kāneʻohe Bay. Other box drains discharge runoff west of the runway to the ocean. The base main cantonment area east of the runway is drained by a series of pipe drain systems primarily to Kailua Bay. A narrow center portion of the base covering an area east of G Street to Craig Avenue is drained by a channel discharging southward into Kāneʻohe Bay. The east side of the base drains southward via pipe systems and a channel into the Nuʻupia Ponds.

3.3.1.2 MCTAB

MCTAB is in the Waimānalo watershed bounded by the Koolau Range to the southwest and the Aniani Nui–Waimānalo–Kaiwa Ridge lines to the northwest. Rainfall averages 40 inches per year (Rainfall Atlas of Hawaiʻi, 2023). The eastern boundary of MCTAB is bordered by Waimānalo Bay. There are two streams at MCTAB, Waimānalo (perennial) and Inoaole (intermittent). Both streams enter the ocean at Bellows Beach (Marine Corps, 2012). Much of the land at MCTAB is open with only a small percent covered by buildings, roads, and runways. Stormwater 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. Ground-based training currently conducted at MCTAB adheres to MCB Hawaii Order 1500.9C, which prohibits training near Waimānalo Stream.

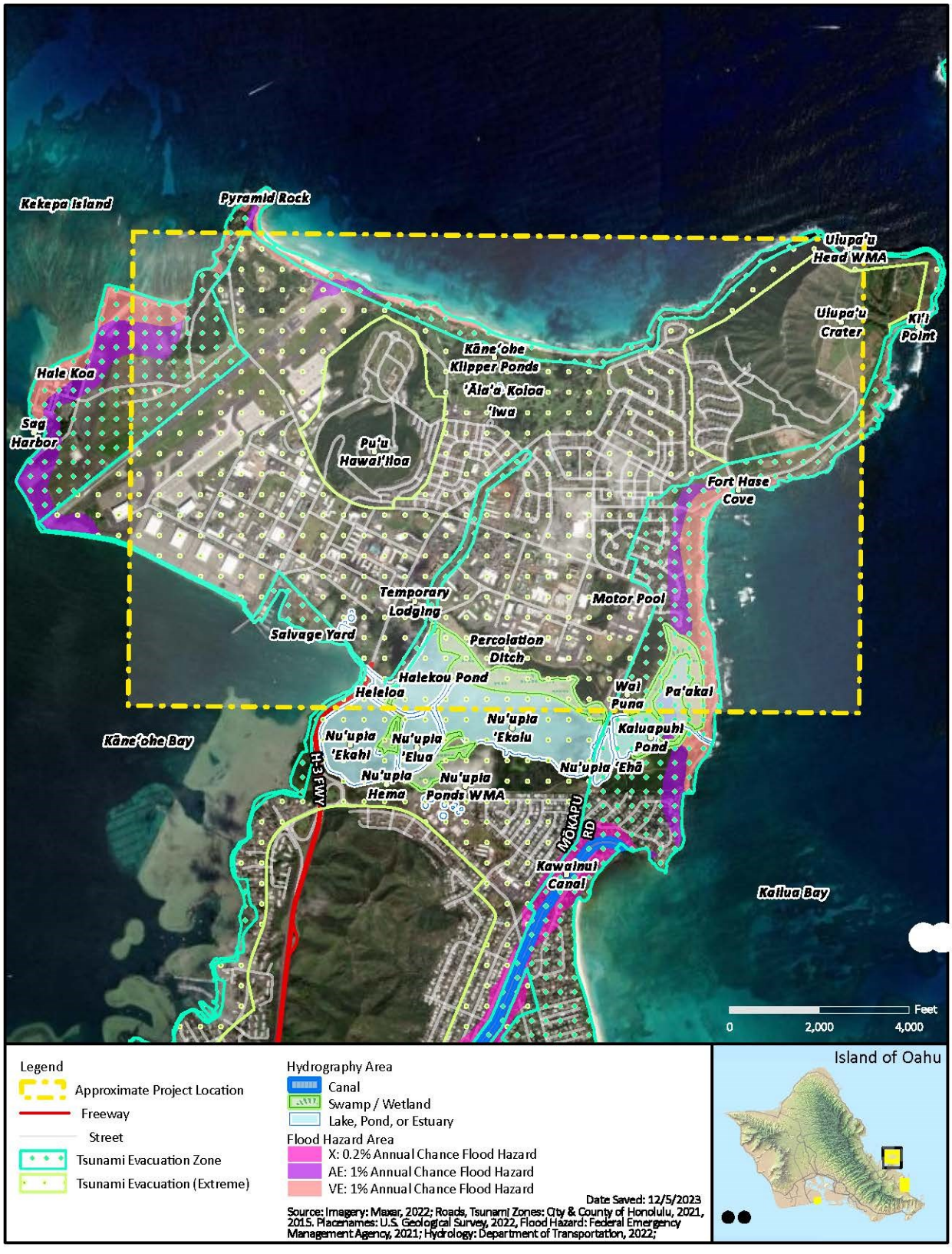


Figure 3.3-1 Water Resources and Flood Zones at MCB Hawaii Kaneohe Bay

3.3.1.3 Pu‘uloa RTF

Pu‘uloa RTF is located within the Pearl Harbor watershed, a 110-square mile watershed subdivided into nine sub-watersheds. These sub-watersheds contain the headwaters of nine streams that drain into Pearl Harbor. The affected area is located within the Honouliuli sub-watershed of the Pearl Harbor watershed, the westernmost sub-watershed within the Pearl Harbor Watershed. Annual rainfall ranges from an average of 47 inches at the Waianae Mountain peaks to 24 inches near the H-1 Freeway. Pu‘uloa RTF is in the coastal plain approximately 3.7 miles to the southwest of the Honouliuli stream. There are no surface waters or wetlands at Pu‘uloa RTF (MCB Hawaii, 2019).

3.3.2 Environmental Consequences

This analysis focuses on the potential impacts of the proposed action on marine waters, groundwater, surface water, wetlands, and floodplains. No changes to the on- or off-base wastewater management systems would be required for the proposed action because there would be no change in the numbers of Marine Corps Hawaii personnel resulting from the proposed action. Groundwater analysis focuses on the potential for impacts to the quality, quantity, and accessibility of groundwater, and marine and surface water quality considers the potential for impacts to improve or degrade current water quality. The impact assessment of wetlands considers the potential for impacts to the hydrology, soils, and vegetation that support a wetland. The analysis of floodplains considers whether the project may impede the functions of floodplains and drainage systems in conveying floodwaters.

3.3.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur and there would be no change to water resources.

3.3.2.2 Facilities Alternatives

Preferred Facilities Locations

At MCB Hawaii Kaneohe Bay, the construction supporting the proposed action would involve construction in impervious and pervious undeveloped landscaped surface areas. Construction in previously undeveloped but landscaped areas would be on approximately 3 acres and would not directly disturb marine waters, groundwater, surface waters, or wetlands. Projects 2, 3, 5, and 7 are adjacent to the Percolation Ditch Wetland and Motor Pool Wetland (see Figures 2-1 and 3.3-1).

The proposed action would result in approximately 3 acres of new impervious surface area at the installation. This is a small change in impervious area at the installation representing less than a 1% increase in impervious areas on the installation. As required, all new facilities would implement LID elements and appropriate BMPs to maintain stormwater discharges to pre-development hydrologic conditions and the stormwater pollution control measures would comply with the installation NPDES MS4 permit. This small increase in impervious surface area would result in less than significant impacts to the amount and type of stormwater flow going into marine waters. The project design features in Table 2-4, including bioretention, vegetated swales, and pervious pavement, are designed to manage stormwater volumes to prevent any potential flooding or ponding at or near the affected area. In addition, the proposed construction would occur in compliance with the MCB Hawaii Kaneohe Bay MS4 permit (MCB Hawaii, 2023b), which includes authorized stormwater and non-stormwater discharges. The plan addresses stormwater runoff from industrial sites into Kāne‘ohe Bay, Nu‘upia Ponds, Kailua Bay, and the Mōkapu Central Drainage Channel and identifies approved stormwater management

procedures and design features consistent with DOH NPDES and USEPA Federal Facility Compliance Agreement requirements.

Last, the new and renovated support facilities would include oil/water separators that are connected to the wastewater and stormwater system with a diverter valve to send flow to the appropriate system. Following oil separation and its storage in separate tanks, the remaining water is then discharged to the on-base wastewater treatment facility. These sites and the oil/water separator systems are subject to regular inspection and maintenance.

Coastal regions adjacent to the affected areas are in FEMA flood zones. Per EO 13690, it is the policy of the U.S. to improve the resilience of federal assets against the impacts of flooding. The proposed action would be designed to account for this increased flood risk potential.

The BMPs in Table 2-4 would manage stormwater volumes to minimize any potential flooding or ponding at or near the affected area. Construction staging areas would employ appropriate BMPs such as bioretention, vegetated swales, and/or vegetated filter strips as required during construction to reduce any temporary risk of increases in runoff and pollution. The affected area does not overlie a drinking water source and is not located near any freshwater surface waters.

Construction activities including site preparation, grading, grubbing, demolition of existing facilities, and utility trenching may indirectly result in soil erosion, sedimentation, and transport of pollutants with a potential to reach downstream waters. A Clean Water Act (CWA) NPDES Construction permit would be required for the proposed action, and would include a site-specific construction SWPPP, requiring the use of BMPs such as runoff detention basins and silt fencing to reduce the potential for soil, sediment, and pollutants to be transported off site. Additional BMPs for sediment control such as silt fences, storm drain inlet protection measures, sediment traps, and sediment basins would further reduce the risk of runoff. These same permit measures and BMPs would also minimize water quality effects associated with projects adjacent to the Percolation Ditch Wetland and Motor Pool Wetland (see Figures 2-1 and 3.3-1).

For these reasons, the preferred facilities locations would have less than significant impacts to water resources.

Alternate Facilities Locations

Under this alternative, alternate facilities locations would primarily involve reuse and renovation of existing facilities, and there would be minimal construction. Only Projects 2 and 3 would involve ground disturbance and construction. Project 2 construction would occur in a developed area and would only alter existing landscaped vegetation occurring in that area. Project 3 would involve the renovation, demolition, and construction of buildings in the 1/12 Gun Park, and would be less than for the preferred facilities Project 3 construction components. Due to the minimal construction at alternate facilities locations, a NPDES permit would not be required. For the same reasons as the preferred alternative, construction activities at the alternate facilities locations would have less than significant impacts to water resources.

3.3.2.3 Operational Alternatives

Alternative 1

MCB Hawaii Kaneohe Bay

Application of BMPs described in Section 2.4 would minimize the potential for training impacts to water resources. Following construction at MCB Hawaii Kaneohe Bay, all stormwater runoff from training would be managed by the existing on-site storm drainage infrastructure. There are no freshwater surface waters or groundwater sources in the training areas, further reducing the possibility of any training impacts to water resources. There would be less than significant impacts to drinking water because there are no potable water wells on the base. MCB Hawaii coordinates with the City and County of Honolulu Board of Water Supply regarding drinking water use. The proposed action would not introduce an increase in personnel, so there would be no change to potable water demand at the installation.

Proposed training with modernized equipment would be similar to the type and tempo for current training activities and would occur in the same locations that training is currently conducted at MCB Hawaii Kaneohe Bay. No additional ground disturbance would occur at the training areas. Current training adheres to MCB Hawaii Order 1500.9C (see Section 2.1.3.2). This includes requirements designed to prevent activities that can affect marine water and freshwater resources. The Order provides specific guidance on procedures for disposing of trash or waste; avoiding draining oil, fuel, or hazardous materials onto the ground or water; avoiding use of detergents or chemicals for cleaning/maintaining vehicles and equipment; avoiding wetlands at MCB Hawaii Kaneohe Bay; and managing and reporting fuel or hazardous material incidents. Compliance with this Order would prevent contaminants from training with the modernized equipment from entering the marine environment, surface water, groundwater, or wetlands. Because the proposed action would not expand training or train outside of or differently than legacy training in existing areas, and the Marine Corps would continue to comply with MCB Hawaii Order 1500.9C procedures, training with modernized equipment would not alter or affect stormwater runoff in the training areas or existing on-site storm drainage infrastructure. Therefore, Alternative 1 training would have less than significant impacts to water resources at MCB Hawaii Kaneohe Bay.

MCTAB

As with training on MCB Hawaii Kaneohe Bay, proposed training with modernized equipment at MCTAB would be similar to the type and tempo for current training activities and would occur in the same locations where training is currently conducted. There are two freshwater streams located at MCTAB. Ground-based training does not and would not occur adjacent to these two streams and the proposed action does not include activities that directly or indirectly affect the streams. Modernized ground-based training would not occur in the marine environment and would follow the procedures identified in BMPs and MCB Hawaii Order 1500.9C. While there is a potential for any motorized vehicle/equipment to accidently deposit fuel, oil, or lubricants, the Marine Corps has accident spill procedures in MCB Hawaii Order 1500.9C to prevent the contaminants from entering the marine or freshwater environment. For these reasons, Alternative 1 training would have less than significant impacts to water resources at MCTAB.

Pu‘uloa RTF

Proposed training associated with modernized equipment at Pu‘uloa RTF would be similar to the type and tempo for current ground-based training activities and would occur in the same locations where

training is currently conducted. The proposed action would not increase or change the amount of small weapons or other training that currently occurs at Pu‘uloa RTF. The description above for training with modernized equipment regarding the potential for effects to the marine and freshwater environment at MCTAB is the same for proposed training with modernized equipment at Pu‘uloa RTF. The Marine Corps would follow the same existing MCB Hawaii Order 1500.9C procedures for training with modernized equipment. Furthermore, there are no surface waters or wetlands at Pu‘uloa RTF (MCB Hawaii, 2019). Therefore, there would be no change in the potential for contaminants affecting the marine and freshwater quality. For these reasons, Alternative 1 training would have less than significant impacts to water resources at Pu‘uloa RTF.

Alternative 2

As identified previously, Alternative 2 would have an additional 20% of training events annually with the modernized equipment when compared with Alternative 1. This would increase the potential for effects to water resources associated with accidental spills or leaks. However, training would be identical to the type and tempo analyzed above for Alternative 1 and would continue to occur in the same locations that training is currently conducted at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF. No additional ground disturbance would occur at the training areas as it would occur at areas currently used for this type of training. The Marine Corps would continue to follow the same existing MCB Hawaii Order 1500.9C procedures for training with modernized equipment, resulting in a less than significant change in potential impacts to water quality. Furthermore, this increased tempo would occur in the same areas used for existing ground-based training and would not alter or affect stormwater runoff in the training areas or existing on-site storm drainage infrastructure. Therefore, while the increased activity slightly increases the potential for water resource effects to occur, the potential overall effects to water resources from an increased level of training would be managed on an individual case basis just as it is currently done for ground-based training at these locations, in accordance with MCB Hawaii Order 1500.9C procedures. For these reasons, Alternative 2 training would have less than significant impacts to water resources at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF.

3.4 Cultural Resources

Cultural resources are the physical evidence or places of current and past human activity. Cultural resources can include historic properties that consist of buildings, structures, objects, districts, and sites that are listed in or eligible for listing in the NRHP. Cultural resources can also include Native American Graves Protection and Repatriation Act (NAGPRA) cultural items as defined in Section 3001 of title 25, U.S.C. (NAGPRA); Native Hawaiian sacred sites as defined in EO 13007, *Indian Sacred Sites*, 24 May 1996; archaeological resources as defined in section 470 aa-mm of Title 16, U.S.C. (Archaeological Resources Protection Act); archaeological artifact collections and associated records as defined in 36 CFR 79 (Curation of Federally Owned or Administered Archeological Collections); and DoD Instruction 4712.16.

3.4.1 Affected Environment

The affected environment for cultural resources is based on the area of potential effects (APE) of an NHPA Section 106 undertaking, through consultation with the SHPD. An APE is defined in 36 CFR Section 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 encompasses new construction; building demolitions; renovations and modifications; the locations of where new buildings or structures could potentially detract from the integrity of setting and feeling of cultural resources through visual, audible (noise), or atmospheric changes; and Marine Corps training areas where modernized equipment would be utilized. The construction portions of the APE include the preferred locations for facilities Projects 2, 3, 6, 7, and 8, and the alternate locations for facilities Projects 2 and 3. The location of the proposed facilities construction areas at MCB Hawaii Kaneohe Bay are shown in Figure 3.4-1. The training areas are at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF and are shown in Figures 1-3, 1-4, and 1-5.

There are no known NAGPRA cultural items located within the APE. No Native Hawaiian sacred sites have been identified within the APE during prior consultation with Native Hawaiian Organizations. There are no archaeological artifact collections and associated records curated within the APE.

Historic properties are known to be located within the APE. This analysis of cultural resources addresses two resource components of historic properties: archaeology and architecture. Archaeological resources are generally sites where human activity measurably altered the earth and/or left deposits of physical remains, and architectural resources include standing buildings, structures, and other built-environment resources of historic or aesthetic significance. Archaeological and architectural resources can be grouped together to comprise a district or landscape.

3.4.1.1 Historical Background

Detailed historical backgrounds for MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF are found in the MCB Hawaii ICRMP (Tomonari-Tuggle and Clark, 2021) in Appendix C.

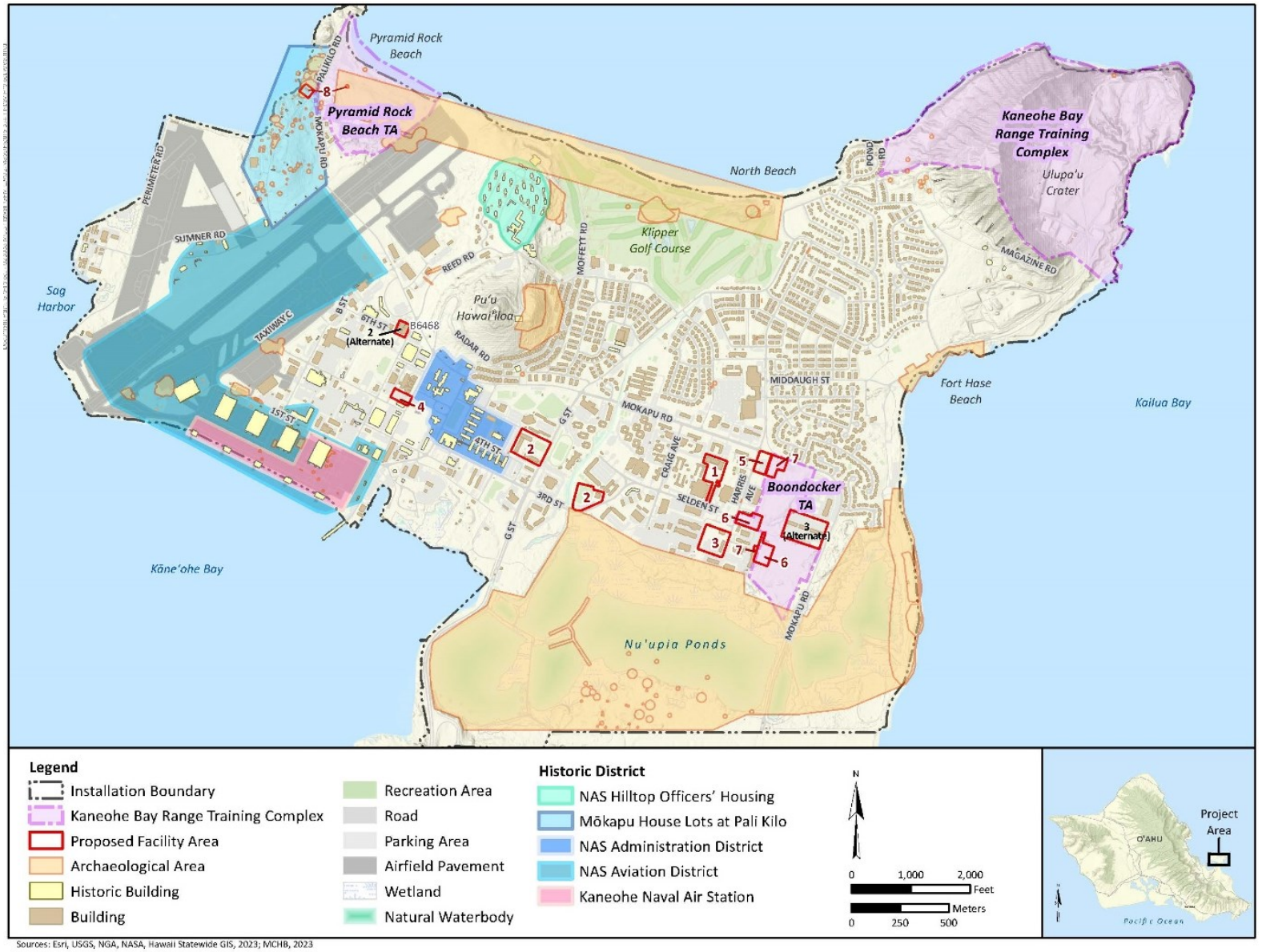


Figure 3.4-1 Cultural Resources and Project Facilities Construction Areas Located at MCB Hawaii Kaneohe Bay

3.4.1.2 Archaeological Resources

MCB Hawaii has conducted numerous inventories of cultural resources at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF identifying properties and determining their eligibility for listing in the NRHP. The results of these studies are summarized in MCB Hawaii's *Integrated Cultural Resources Management Plan* (Tomonari-Tuggle and Clark, 2021), and *Cultural Landscape Report* (MCB Hawaii, 2018). Table 3.4-1 summarizes the cultural resources within the affected area. Archaeological testing in accordance with the Revised Work Plan is currently being conducted for all proposed construction locations to provide project-specific information on archaeological resources (NAVFAC Pacific, 2023). Following completion of the fieldwork, the Marine Corps will share the findings with SHPD and integrate the information into an updated assessment of potential impacts in the Final EA. The Marine Corps will continue to coordinate with SHPD as part of the NHPA Section 106 process.

Table 3.4-1 Archaeological Resources in the APE

SIHP Site No. 50-80-11-	*District/ Area*	*Period*[1]	*Site Description*	*NRHP Status*[2] *(Significance Criterion)*[3]	*Location*
MCB Hawaii Kaneohe Bay					
0366	N/A	TH	Lu-o-Wai-o-Kanaloa (Brackish well, possibly buried beneath Runway 4/22).	Not located; Not evaluated	Pyramid Rock Beach Training Area
0367	Mōkapu House Lots Archaeological District at Pali Kilo	TH	Hina Stone; boulder; a fishing shrine, a fish trap (Pa Ohua), and shrine with two stones representing Ku and Hina	R-yes (B, C, D)	Adjacent to Preferred 8
1017	N/A	TH	MBA, including Burial Site H	NRHP Listed (C, D)	Within/adjacent to Preferred 8
4626	N/A	TH	Modified outcrop	R-yes (D)	Kaneohe Bay Range Training Complex
4891	N/A	TH	Subsurface cultural deposit	R-yes (D)	Pyramid Rock Beach Training Area
5733	Mōkapu House Lots Archaeological District at Pali Kilo	TH, NM	Subsurface cultural deposits and 20th century house foundations	R-yes (D)	Adjacent to Preferred 8
7724	Mōkapu House Lots Archaeological District at Pali Kilo	TH	Disturbed subsurface cultural deposit	R-yes (C, D)	Adjacent to Preferred 8
7725	Mōkapu House Lots Archaeological District at Pali Kilo	NM	Retaining wall	R-yes (C,D)	Adjacent to Preferred 8
MCTAB					
511	Bellows Field Archaeology Area	TH	Area of habitation and burials	NRHP-Listed (D)	MCTAB
3309	Waimānalo Archaeological District (Noncontributing)	NM	Agricultural water catchment system	NRHP-Eligible (D)	MCTAB

SIHP Site No. 50-80-11-	*District/ Area*	*Period[1]*	*Site Description*	*NRHP Status[2] (Significance Criterion)[3]*	*Location*
3311	Waimānalo Archaeological District (Noncontributing)	NM	Irrigation ditch	NRHP-Eligible (D)	MCTAB
3312	Waimānalo Archaeological District (Noncontributing)	NM	Waimānalo Japanese Cemetery	NRHP-Eligible (A, D)	MCTAB
4850	Waimānalo Archaeological District	TH	Discontinuous subsurface cultural deposit near and may extend into MCTAB.	NRHP-Eligible (D)	MCTAB
4851	Waimānalo Archaeological District	TH	Pre-Contact and post-Contact subsurface deposits, 15+ intact burials.	NRHP-Eligible (D)	MCTAB
4852	N/A	TH	Subsurface deposits outside of MCTAB, includes the Bellows Dune Site (O18); three areas of excavation.	NRHP Listed	MCTAB
4853	Waimānalo Archaeological District	TH	Subsurface cultural deposits, possibly contains burials.	NRHP-Eligible (D)	MCTAB
4858	Waimānalo Archaeological District	TH	Stone structures, lithic scatter, subsurface deposits, possibly burials.	NRHP-Eligible (D)	MCTAB
4861	N/A	M	Concrete foundation, artifact scatter	Not evaluated	MCTAB
Pu‘uloa RTF					
N/A	N/A	TH	Area of limestone sinkholes	Not evaluated	Pu‘uloa RTF

Notes: [1]Probable period of use: TH=traditional Hawaiian pre-Contact/19th century; NM=non-military 19th/20th century; M=military 20th century
[2]Status of nomination to the NRHP:
NRHP-listed=Listed in the NRHP
NRHP-eligible= determined eligible for NRHP with SHPD concurrence
Not eligible = determined not eligible for the NRHP with SHPD concurrence
R-yes=recommended eligible for the NRHP, SHPD concurrence not yet received
Not evaluated= no eligibility recommendation has been made to date
[3]NRHP significance criteria:
A=associated with events that have made a significant contribution to the broad patterns of our history;
B=associated with the lives of persons significant in our past;
C=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;
D=yielded, or may be likely to yield, information important in prehistory or history

Legend: MBA = Mōkapu Burial Area; MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; N/A = Not Applicable; NRHP = National Register of Historic Places; RTF = Range Training Facility; SIHP = State Inventory of Historic Places

MCB Hawaii Kaneohe Bay

There have been more than 240 cultural resource projects undertaken at MCB Hawaii Kaneohe Bay. These projects include archaeological surveys, inventories, monitoring, historical architectural inventories and documentation, cultural landscape reporting, and historical and interpretative projects. See Figure 3.4-1 for generalized locations of archaeological resources. Through the results of these studies, Cultural Resource Management Zones (CRMZs) and a model of archaeological sensitivity (Tomonari-Tuggle and Clark, 2021:II–86) have been developed. Within each CRMZ, archaeological sensitivity varies based on: (1) an analysis of known site distribution combined with the study of historical settlement/land use and environmental factors to develop a model of pre-contact and early historic settlement patterns; (2) historic and modern development that would have affected site preservation (e.g., landfills, areas where sand has been mined and/or used as fill, dredged areas, ordnance target areas); and (3) areas that have been previously investigated and found to not contain archaeological sites (Tomonari-Tuggle and Clark, 2021). Figure 3.4-2 depicts the MCB Hawaii Kaneohe Bay archaeological sensitivity map.

In addition to known archaeological resources and the modeled archaeological sensitivity, disturbed human remains have been found in redeposited sand fill at various and random locations throughout the peninsula wherever sand fill was used for construction. In the 1930s and during World War II (WWII), sand was mined from the northern dunes (the MBA) and human remains were unknowingly transported with the fill sand. This fill typically occurred in utility trenches, under and around building foundations and concrete pads, and has been found in secondary disturbed contexts at the north end of the airfield. For this reason, MCB Hawaii has consistently required monitoring of ground-disturbing activities to identify any presence of human skeletal remains and ensure any encountered are treated under conditions agreed upon with Native Hawaiian descendants and organizations (Tomonari-Tuggle and Clark, 2021).

Preferred Facilities Project Locations

The affected areas for the preferred alternatives for facilities Projects 2, 3, 6, 7, and 8 are located adjacent to or within the boundaries of known archaeological resources (see Table 3.4-1).

Nu‘upia Pond, which is part of the Mōkapu Peninsula Fishpond Complex (State Inventory of Historic Places [SIHP] Site No. 50-80-11-1002), is located near the affected areas for Projects 2, 3, 6, and 7 (see Table 3.4-1). Although none of these projects would occur within the known boundaries of the site, prior archaeological testing and monitoring identified buried fishpond sediments associated with the site within 200 feet south of Project 3 location (Tomonari-Tuggle and Clark, 2021). This suggests the fishpond may have extended farther north than the currently recognized boundary and that there could be buried archaeological resources associated with the fishpond on or near its northern boundary.

Five archaeological resources are located adjacent to Project 8 (see Table 3.4-1). Four of these are contributing elements to the Mōkapu House Lots, which are near the proposed Air Control Battery Compound Warehouse component of Project 8. The fifth resource is the MBA (SIHP Site 50-80-11-1017); the proposed G/ATOR pad is within the boundaries of this site.

There are no known archaeological resources within or adjacent to the affected areas for the preferred alternatives for Projects 1, 4, and 5.

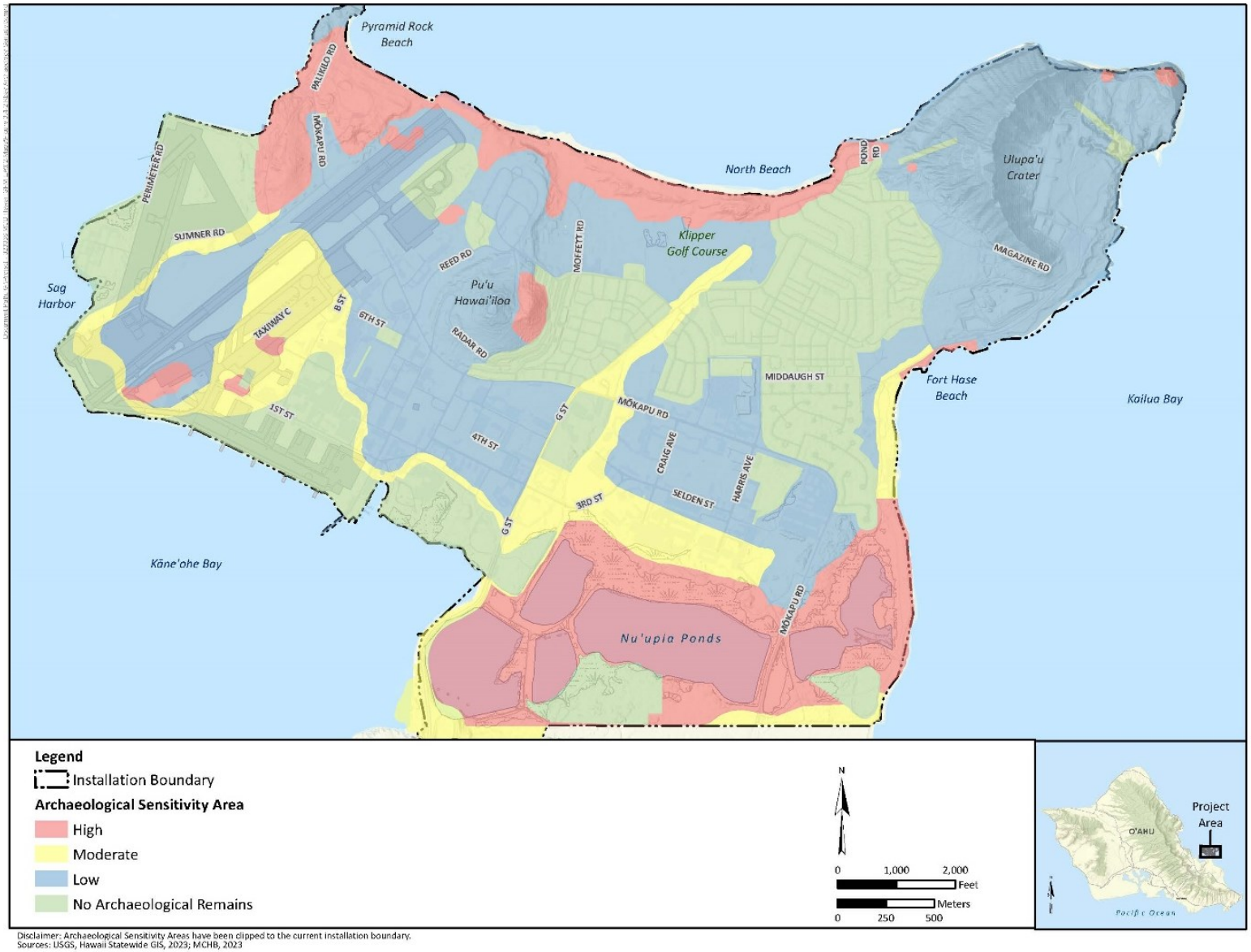


Figure 3.4-2 Archaeological Sensitivity Areas at MCB Hawaii Kaneohe Bay

Alternative Facilities Locations

There are no known archaeological resources within or adjacent to the locations of alternate facilities Projects 2 or 3.

MCTAB

Archaeological resources located within MCTAB include features of the NRHP-listed Bellows Airfield Archaeological Area, four traditional Hawaiian period sites that are contributing elements to the Waimānalo Archaeological District, three individual traditional Hawaiian period sites (including deposits of the Bellows Dune Site O-18 that may extend into MCTAB), three non-military historic period sites that are non-contributing elements of the Waimānalo Archaeological District, and two military Historic period sites (see Table 3.4-1; Figure 3.4-3; Tomonari-Tuggle and Clark, 2021). The archaeological sensitivity for MCTAB is shown in Figure 3.4-4.

Pu'uloa RTF

Archaeological resources at Pu'uloa RTF are limited to one area of archaeological interest (see Table 3.4-1) that has been noted but not formally documented. The area of archaeological interest is an area of limestone sinkholes noted by Tuggle (1984), Tuggle and Wilcox (1998), and Tomonari-Tuggle and Clark (2021). The archaeological sensitivity map for Pu'uloa RTF is shown in Figure 3.4-5.

3.4.1.3 Architectural Resources

Architectural resources located within or near the APE are listed in Table 3.4-2. These resources include buildings, structures, and objects that are listed or eligible for listing in the NRHP. These resources are summarized by location below.

MCB Hawaii Kaneohe Bay

Architectural resources at MCB Hawaii Kaneohe Bay include individual buildings and structures that are eligible for or listed in the NRHP, as well as buildings and structures located within the Naval Air Station (NAS) Kaneohe Bay Administration District (Tomonari-Tuggle and Clark, 2021). Additionally, a cultural landscape report (MCB Hawaii, 2018) identified architectural resources throughout the installation as contributors to the historic character of MCB Hawaii Kaneohe Bay.

Architectural resources located within or near the proposed facilities are listed in Table 3.4-2 and depicted on Figures 3.4-6 through 3.4-8. One architectural resource determined eligible for listing in the NRHP, a storage shed, is located in the MCB Hawaii Kaneohe Bay RTF (see Table 3-4.2 and Figure 3.4-7).

MCTAB

There are five architectural resources eligible for the NRHP within the MCTAB affected area (see Table 3.4-2 and Figure 3.4-9). These include two WWII-era revetment complexes, two Cold War-era buildings, and coastal defense structures (defense battery groups) that comprise part of the MCTAB Cultural Landscape.

Pu'uloa RTF

Three architectural resources constructed in 1942 have been determined eligible for the NRHP within the Pu'uloa RTF affected areas (see Table 3-4.2; Figure 3.4-10). These include a Type D Casualty Station, a Splinter-proof Air Raid Shelter, and a group of three concrete bunkers.

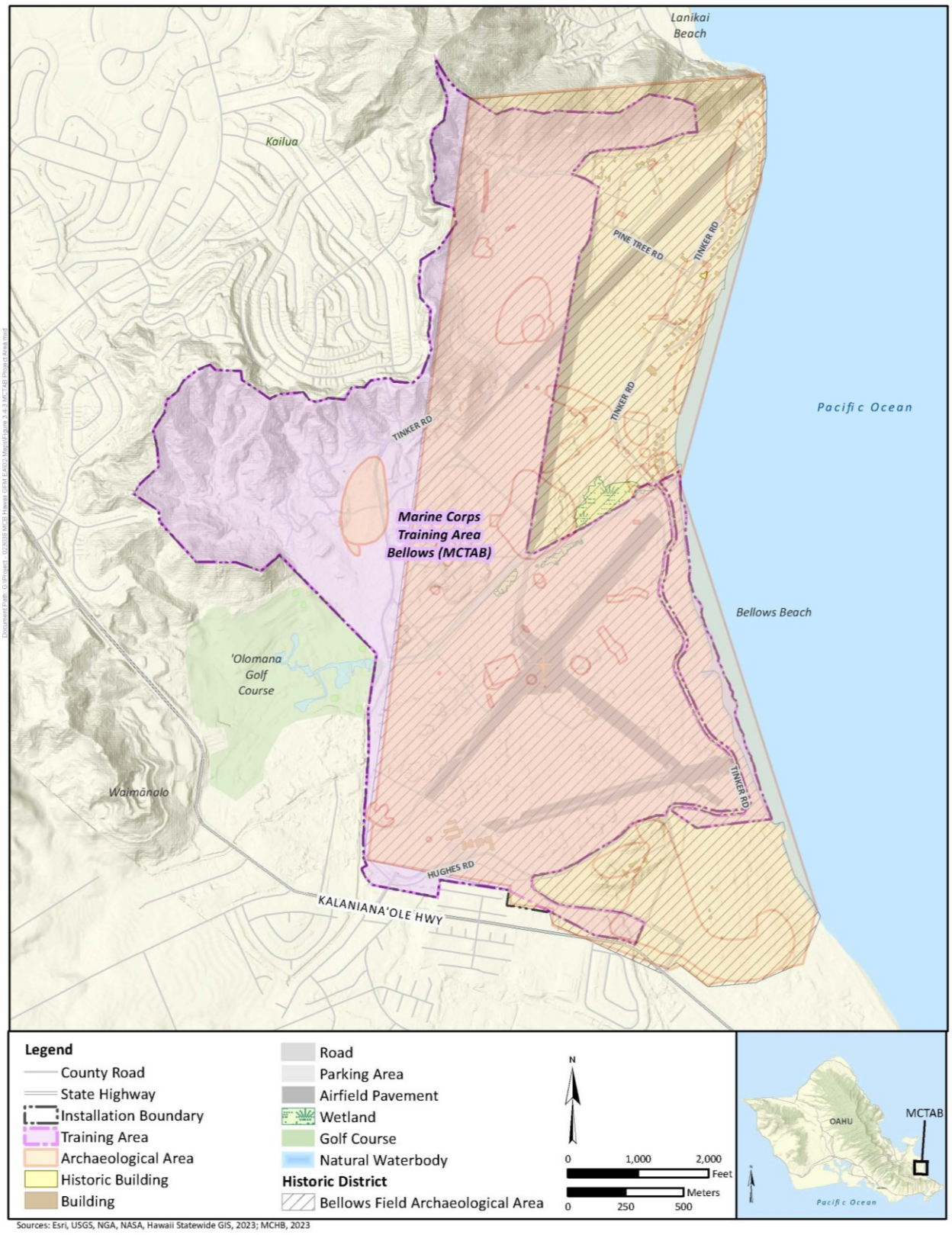


Figure 3.4-3 Cultural Resources at MCTAB

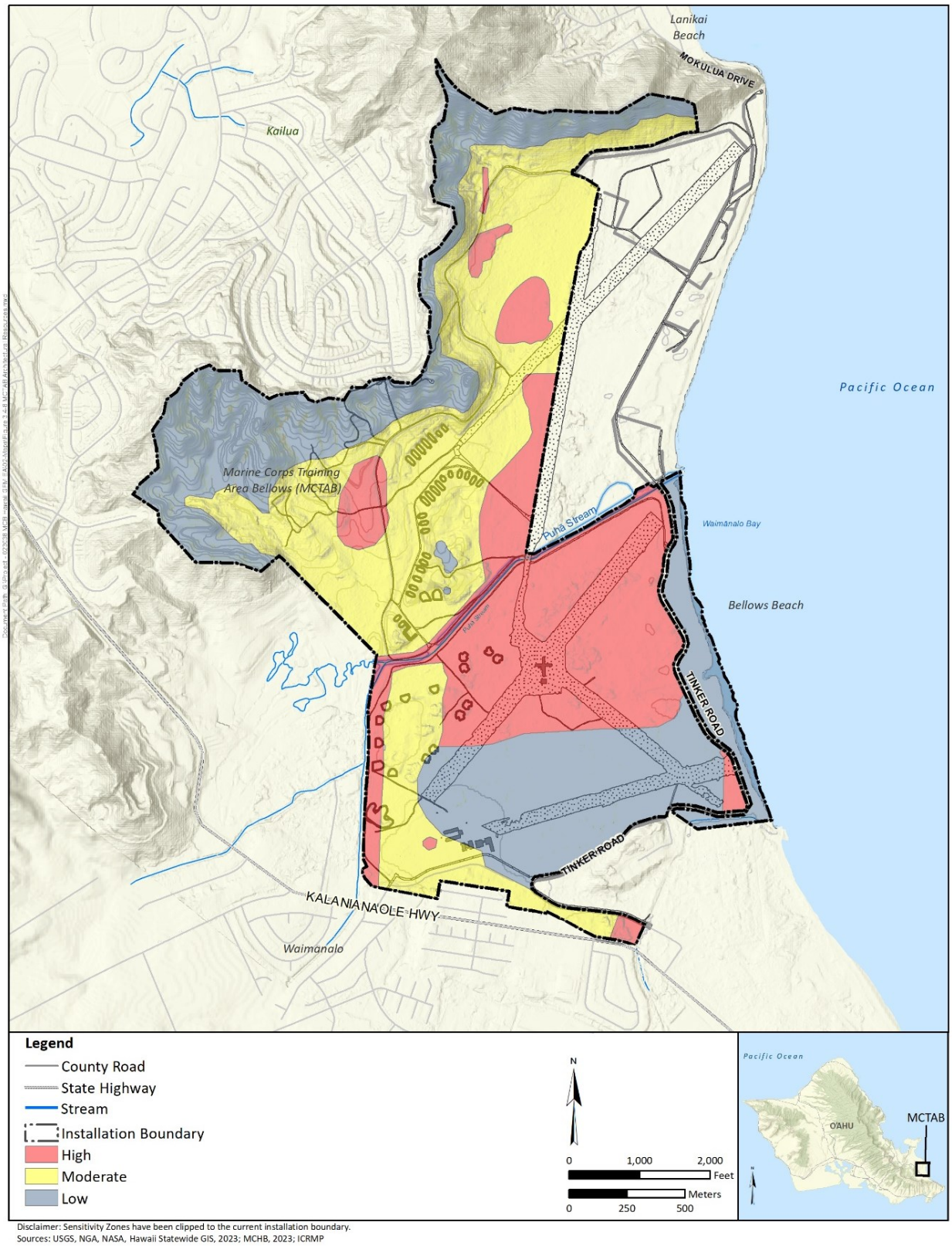


Figure 3.4-4 Archaeological Sensitivity Areas at MCTAB

Disclaimer: Sensitivity Zones have been clipped to the current installation boundary.
Sources: USGS, NGA, NASA, Hawaii Statewide GIS, 2023; MCHB, 2023; ICRMP

Figure 3.4-5 Archaeological Sensitivity Areas at Pu'uloa RTF

Table 3.4-2 Architectural Resources in the APE

Name/ Building #	*Year Built*	*NRHP Status[1] (Significance Criterion)[2]*	*Potential Impacts*
MCB Hawaii Kaneohe Bay			
NAS Kaneohe Bay Administration District	WWII	NRHP-eligible (A)	Potential visual impacts from preferred facilities Projects 2 and 4
Storage Shed (HQ BN [Training])/ 3039	1943	NRHP-eligible (A)	Potential physical impacts from training
MCTAB			
Revetments/ no #	Pre-1944	NRHP-eligible (A, C)	Potential physical impacts from training
Concrete bunkers and bomb dispersal revetments (Site 4860)/ no #	Pre-WWII	NRHP-eligible (A, D, and possibly C)	Potential physical impacts from training
Transmitter Building/700A	1957	NRHP-eligible (A, C)	Potential physical impacts from training
Ready Power Building/701	1957	NRHP-eligible (A, C)	Potential physical impacts from training
Coastal Defense Structures	WWII	NRHP-eligible (A, C)	Potential physical impacts from training
Pu'uloa RTF			
Type D Casualty Station/48	1942	NRHP-eligible (A, C)	Potential physical impacts from training
Splinterproof Air Raid Shelter/ 136	1940	NRHP-eligible (A, C)	Potential physical impacts from training
Three concrete bunkers/ no #	1942	NRHP-eligible (Criteria not specified in prior documentation)	Potential physical impacts from training

Notes: [1]Status of nomination to the NRHP:
NRHP-eligible= determined eligible for NRHP with SHPD concurrence
[2]NRHP significance criteria:
A=associated with events that have made a significant contribution to the broad patterns of our history.
C=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.
D=yielded, or may be likely to yield, information important in prehistory or history.

Legend: # = number; BEQ = Bachelor Enlisted Quarters; BN = Battalion; HQ = Headquarters; MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; N/A = Not Applicable; NAS = Naval Air Station; NRHP = National Register of Historic Places; RTF = Range Training Facility.

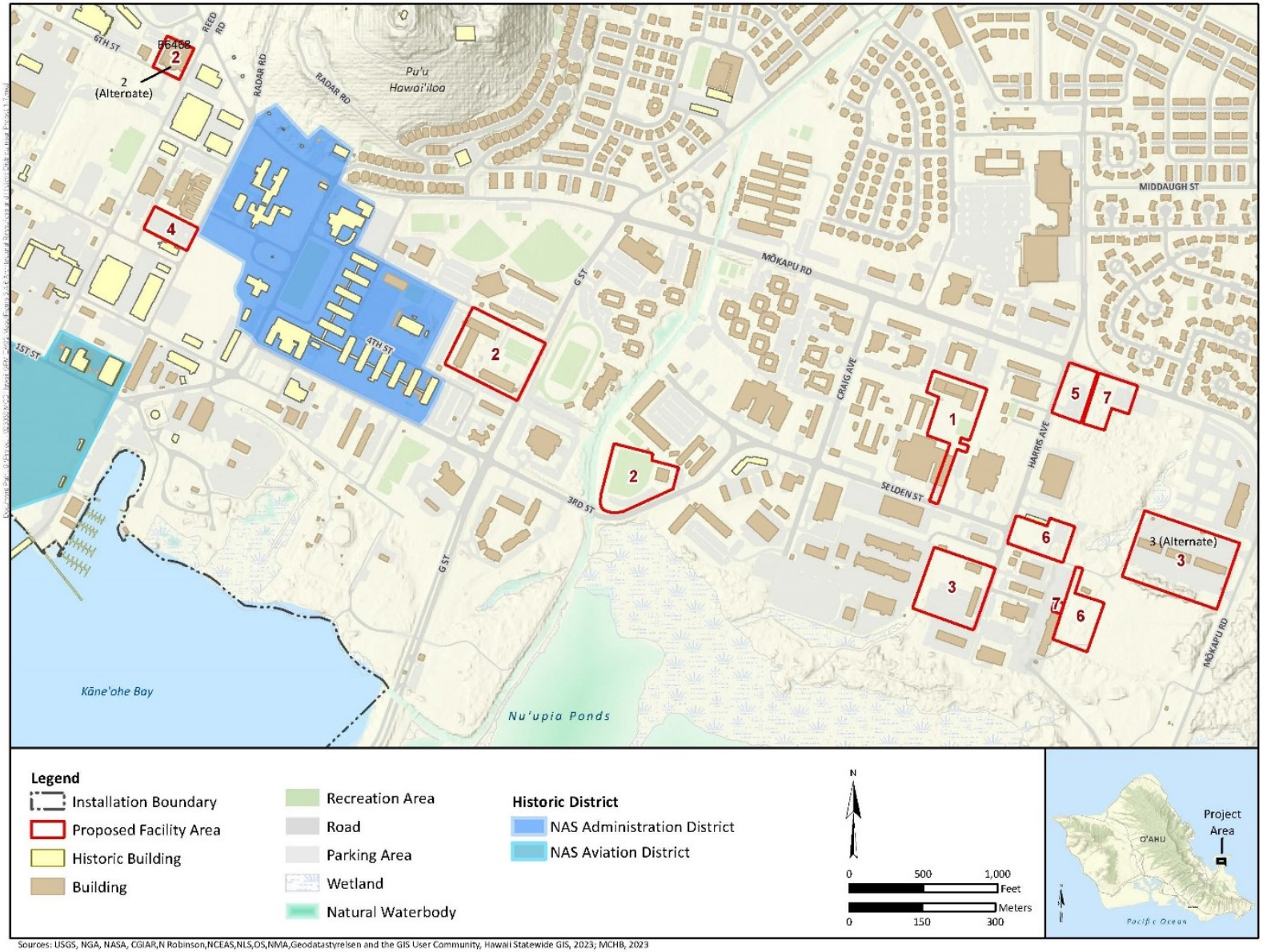


Figure 3.4-6 Architectural Resources and Historic Districts near Projects 1 through 7 at MCB Hawaii Kaneohe Bay

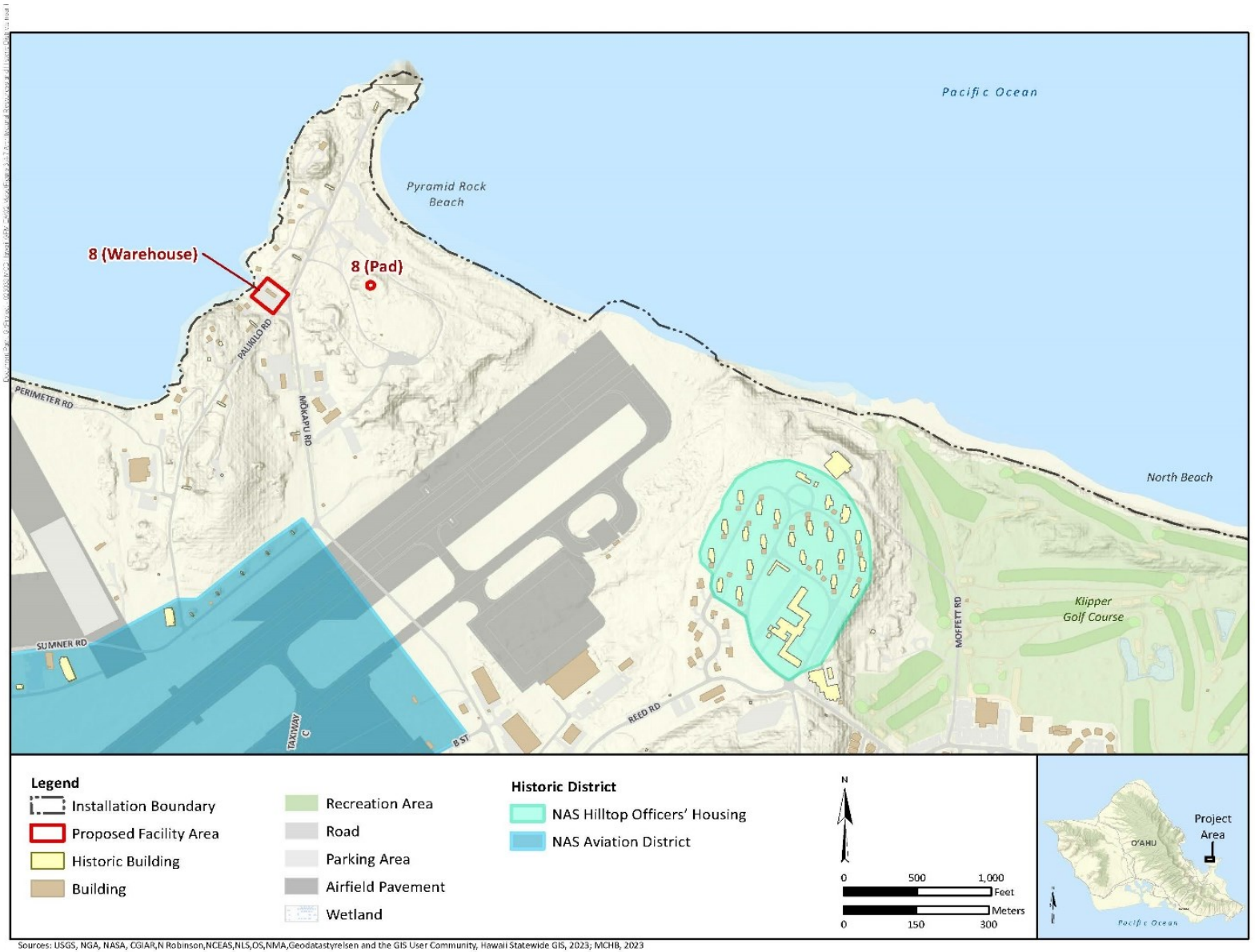


Figure 3.4-7 Architectural Resources and Historic Districts near Project 8 at MCB Hawaii Kaneohe Bay

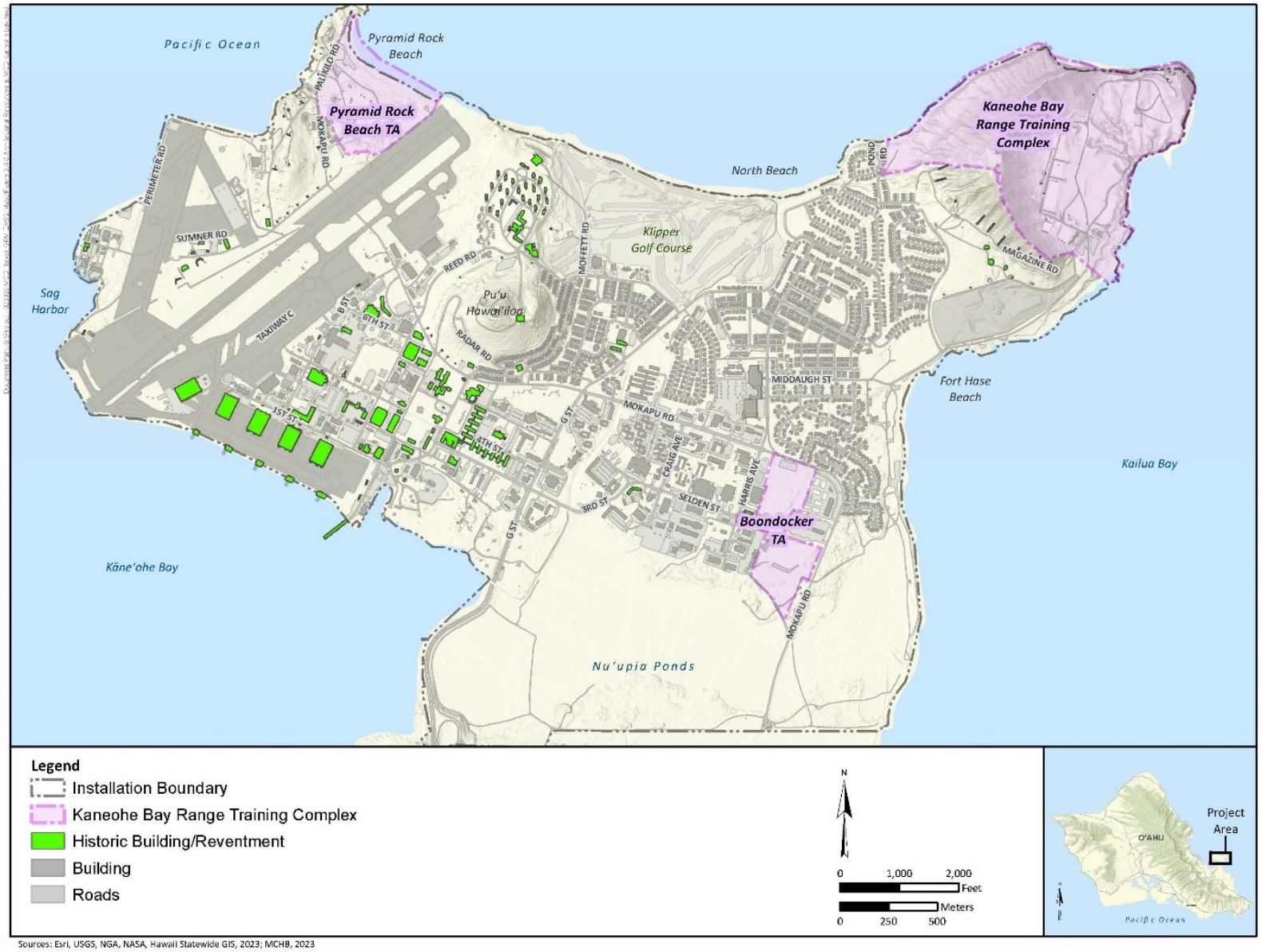
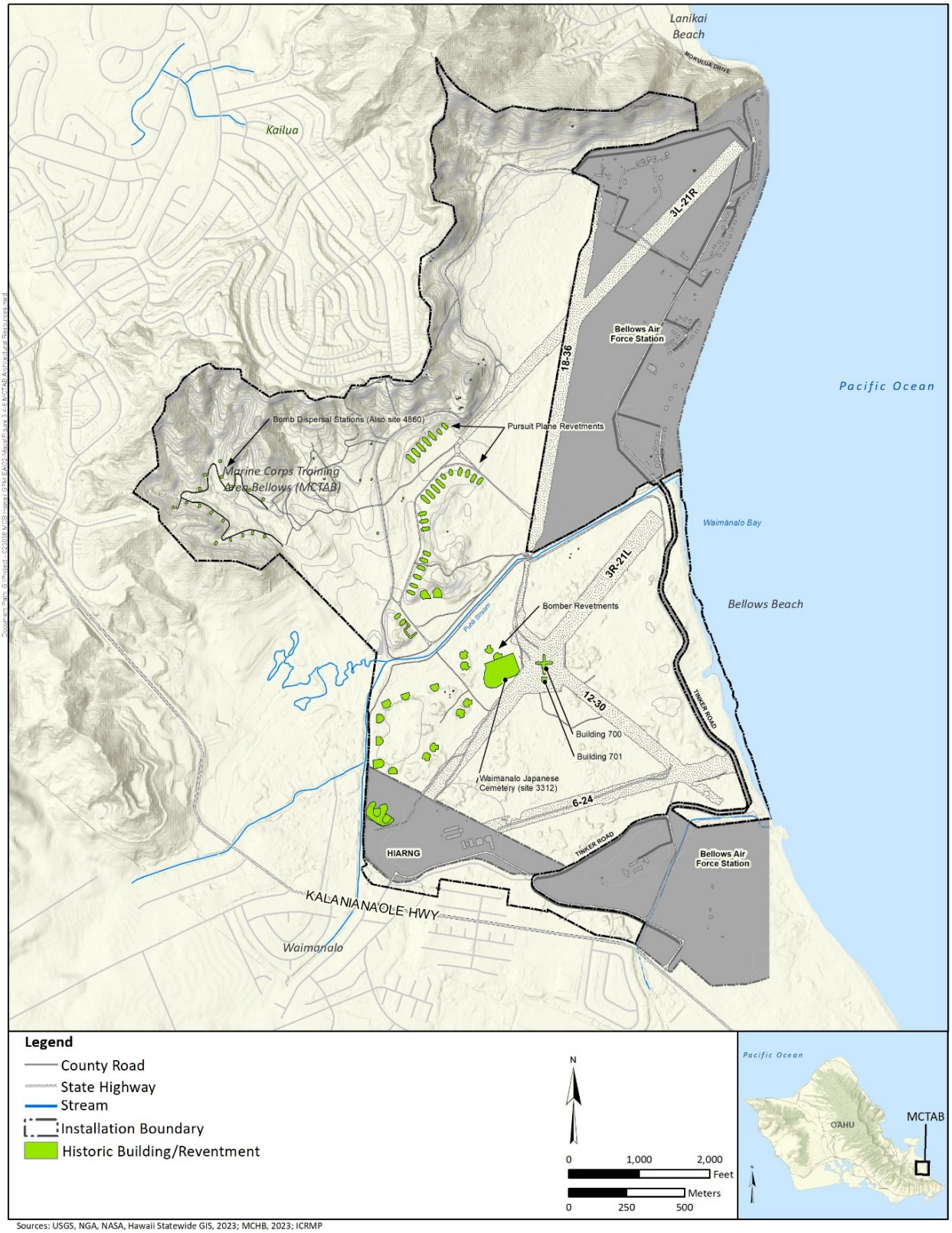


Figure 3.4-8 Architectural Resources at MCB Hawaii Kaneohe Bay Training Areas



Sources: USGS, NGA, NASA, Hawaii Statewide GIS, 2023; MCHB, 2023; ICRMP

Figure 3.4-9 Architectural Resources at MCTAB

Disclaimer: Sensitivity Zones have been clipped to the current installation boundary.
Sources: USGS, NGA, NASA, CGIAR,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community, Hawaii Statewide GIS, 2023; MCHB, 2023; ICRMP

Figure 3.4-10 Architectural Resources at Pu'uloa RTF

3.4.2 Environmental Consequences

NEPA incorporates NHPA analysis of historic properties as part of the overall evaluation of environmental consequences and also addresses environmental impacts to all other categories of cultural resources. NEPA and NHPA are separate statutes that evaluate and address impacts differently. For example, effects of a proposed action on a historic property can be "adverse" under the NHPA Section 106 without triggering a determination of "significance" under NEPA, and a proposed action that has been determined to result in no adverse effects to historic properties under NHPA Section 106 of the NHPA can rise to the level of "significance" under NEPA for factors other than impacts to historical resources.

The analysis of potential effects on historic properties is based on the following considerations: (1) physically altering, damaging, or destroying all or part of a property; (2) altering characteristics of the surrounding environment that contribute to property significance; (3) introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or (4) neglecting the property to the extent it deteriorates or is destroyed. In the case of the proposed action, potential effects to historic properties could result from damage caused by ground-disturbing activities associated with facility construction, demolition, or modification, as well as the introduction of new buildings or structures that could detract from the integrity of the setting or feeling of a historic property through visual, audible (noise), or atmospheric changes due to project implementation.

Under Section 106, adverse effects to historic properties must be resolved through measures that avoid, minimize, or mitigate the effects. Under NEPA, potential impacts can be mitigated through avoiding, minimizing, or reducing impacts, as well as compensating for impacts to the human environment. Mitigation of impacts to cultural resources, including historic properties as required by Section 106 and NEPA, can reduce those impacts below the threshold of concern for NEPA.

Early in the planning process, MCB Hawaii determined the proposed action may have the potential to affect historic properties and initiated NHPA Section 106 consultation in September 2023. The Marine Corps will continue to coordinate with the SHPD as part of the NHPA Section 106 process.

3.4.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur and there would be no change to cultural resources.

3.4.2.2 Facilities Alternatives

Preferred Facilities Locations

Archaeological Resources

Construction projects at the preferred facilities locations include the following activity types: demolishing existing buildings and structures, constructing new buildings and structures, modifying/renovating buildings, repaving, adding fencing, installing underground utilities within the construction footprints, and staging construction equipment.

Archaeological testing in accordance with the Revised Work Plan is currently being conducted for all proposed construction locations to provide project-specific information on archaeological resources (NAVFAC Pacific, 2023). Following completion of the fieldwork, the Marine Corps will share the findings with SHPD and integrate the information into an updated assessment of potential impacts in the Final EA. The Marine Corps will continue to coordinate with SHPD as part of the NHPA Section 106 process.

For all construction activities, archaeological monitoring would occur during project-related ground-disturbing activities as a BMP consistent with SOP 3 for Work in Archaeologically Sensitive Areas at MCB Hawaii. The monitoring would be performed in accordance with an archaeological monitoring work plan that would be reviewed and approved by the MCB Hawaii Cultural Resource Manager. This would incorporate requirements of the NAGPRA and applicable SOPs described in the 2021 MCB Hawaii ICRMP (Tomonari-Tuggle and Clark, 2021). Monitoring would consist of identification, evaluation, collection, recording, analysis, and reporting of any archaeological remains identified during ground-disturbing activities. Any archaeological resources identified would be considered post-review discoveries under NHPA Section 106, and actions to mitigate effects to those resources would be developed in accordance with 36 CFR 800.13.

The G/ATOR Pad portion of Project 8 would reuse an existing non-historic concrete pad located within the boundaries of the MBA (SIHP Site 50-80-1017) without involving ground disturbance or otherwise altering its immediate surroundings. Thus, Project 8 would not impact the MBA (SIHP Site 50-80-1017).

For these reasons, construction projects at the preferred facilities locations would have less than significant impacts to archaeological resources at MCB Hawaii Kaneohe Bay.

Architectural Resources

The proposed facilities for Project 2 and Project 4 would include the construction of new buildings that would be visible from the historic NAS Kaneohe Bay Administration District. The addition of these buildings to the viewplanes of the historic district could potentially diminish the district's integrity of setting and feeling. Any potential visual effects to the historic district from the new construction would be minimized by designing the new facilities to reflect the district's historic character to the greatest extent practicable, noting that the mission requirements may limit some of the design options. The size, massing, design, and siting of the new facilities would be compatible with the district, the elements within it, and the historic setting of the district. By designing the new facilities to minimize the visual impacts to the NAS Kaneohe Bay Administration District, construction projects at the preferred facilities locations would have less than significant impacts to architectural resources at MCB Hawaii Kaneohe Bay.

Alternate Facilities Locations

Archaeological Resources

This alternative proposes construction at only two locations: ground disturbance and construction at the alternate Project 2; and the renovation, demolition, and construction of buildings at the alternate Project 3 location. Archaeological testing at this location conducted prior to the construction of the existing Building 6468 identified no archaeological resources (Tomonari-Tuggle and Clark, 2021). Archaeological testing is being conducted at the alternate Project 3 location in accordance with the Revised Final Work Plan (NAVFAC Pacific, 2023). Following completion of the fieldwork in January 2024, the Marine Corps will share the findings with the SHPD and integrate the information into the assessment of potential impacts in the Final EA.

For all construction activities, archaeological monitoring would occur during project-related ground-disturbing activities as a BMP as described above for the preferred facilities project locations, and any archaeological resources identified would be considered post-review discoveries under NHPA Section 106. Actions to mitigate effects to those resources would be developed in accordance with 36 CFR 800.13.

For these reasons, construction projects at the alternate facilities locations would have less than significant impacts to archaeological resources at MCB Hawaii Kaneohe Bay.

Architectural Resources

The alternate facilities locations do not contain architectural resources, nor are they located within historic districts. Construction projects at the alternate facilities locations would have no impacts to architectural resources at MCB Hawaii Kaneohe Bay.

3.4.2.3 Operational Alternatives

Alternative 1

Training with the modernized equipment would occur in the same locations and be at the same type and tempo as current ground-based training. The Marine Corps currently conducts ground-based training at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF (see Section 2.1.3, *Training*). MCB Hawaii manages potential impacts to cultural resources from these activities through procedures established per MCB Hawaii Order 1500.9C and the 2021 MCB Hawaii ICRMP (Tomonari-Tuggle and Clark, 2021). Chapter 2 of this order includes specifications for identification of cultural and natural resource constraints, and identification of off-limits areas and prohibited activities. Specific actions carried out during all training to reduce impacts to cultural resources include:

- The enforcement of federal and state historic preservation laws.
- Confinement of activities to training area boundaries.
- Prohibition of digging or other ground disturbance deeper than 6 inches below the existing surface, including the removal of sand from beaches or shoreline.
- Establishment of off-limits areas that include areas of historical significance.
- Prohibition of the removal or intentional destruction of archaeological materials or artifacts or the disturbance of any archaeological site.
- Absolute prohibition of ground disturbance within or around the Pyramid Rock Training Area MOUT (within the MBA).

The proposed training would continue to adhere to these restrictions and would only occur on existing ranges and range areas, established vehicle paths, and areas already approved for training. Additionally, the upgraded equipment may present a decreased risk of impacting archaeological resources within these already approved areas because it consists of wheeled vehicles that, in some instances, are smaller than the equipment it would replace, which would result in less ground disturbance while in use. Vibrational effects from wheeled-vehicle training activities are not currently known to be impacting cultural resources in the training areas.

As noted in prior resource sections, the modernized equipment, training type and tempo, and location of training events would be similar to existing training and would comply with MCB Hawaii Order 1500.9C and the MCB Hawaii ICRMP, including the restrictions listed above. The modernized equipment itself poses a reduced risk to cultural resources compared to existing equipment. As a result, there is no element of the proposed training that would alter, degrade, or adversely affect archaeological resources (see Table 3.4.1) or architectural resources (see Table 3.4.2) at these training areas. Therefore, Alternative 1 training at MCB Hawaii Kaneohe Bay would have less than significant impacts to cultural resources.

Alternative 2

This alternative includes the same proposed training with modernized equipment as identified in Section 2.1.3 and would be identical to training types and locations described above for Alternative 1, but with a 20% increase in annual training events over current levels. As with the current training, the Alternative 2 training would be performed under the same restrictions established in MCB Hawaii Order 1500.9C and the procedures described in the MCB Hawaii ICRMP (Tomonari-Tuggle and Clark, 2021). These restrictions would, as with Alternative 1, result in no adverse effects to all archaeological resources (see Table 3.4.1) and architectural resources (see Table 3.4.2) during the training. Because adverse effects to cultural resources would be avoided, the increased tempo of Alternative 2 training would result in no impacts. Therefore, Alternative 2 training would have less than significant impacts to cultural resources.

3.5 Terrestrial Biological Resources

Terrestrial biological resources include native and introduced plant and animal species and their habitats. This analysis focuses on species that are important to the function of ecosystems or are protected under federal or state law at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF. Biological resources are divided into the following categories: *Vegetation, Wildlife, and Special-status Species.*

- *Vegetation:* Potential project-related effects to existing vegetation may be caused by removal of vegetation during construction, disturbance from vehicle and foot traffic, and indirect sources such as changes to stormwater volumes and pollutant loads.
- *Wildlife:* Potential stressors to wildlife habitat may include those described above for vegetation and lighting related to construction and training, nesting/breeding season disturbance, potential wildlife-vehicle strikes, and changes in the noise environment during construction and training. Special consideration is given to bird species protected under the Migratory Bird Treaty Act (MBTA) and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds.*
- *Special-status Species* are defined in this EA as species that are listed, have been proposed for listing, or are candidates for listing as threatened or endangered under the ESA and other species of concern as recognized by state or federal agencies. Stressors for special-status species are similar to those described above for vegetation and wildlife but can vary by species (see impact analysis for Special-status Species in Section 3.5.2).

The affected environment for biological resources includes the affected areas at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF that may experience direct and indirect noise, visual, and other physical impacts from the proposed action. When analyzing impacts to vegetation, only facility infrastructure and training areas are considered since effects would be limited to those areas that may be physically disturbed by the proposed action.

The Marine Corps is preparing a Final Biological Assessment (Appendix D) to initiate informal consultation with USFWS, Pacific Islands Office, under section 7 of the ESA. The USFWS is reviewing the Marine Corps' determination that the preferred facilities construction component and Alternative 1 training would have no effect or may affect, but is not likely to adversely affect, ESA-listed species at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF.

3.5.1 Affected Environment

The affected environment section below describes the existing conditions for vegetation and wildlife at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF. Sections 3.5.1.4 and 3.5.1.5 present an overview of federal and state special-status species for all three locations.

3.5.1.1 MCB Hawaii Kaneohe Bay

Vegetation

The affected area consists mostly of built or modified landscape with no notable ecological communities on or adjacent to the construction sites. Historically, the affected area was cleared with heavy equipment and lacks native vegetation cover. Most of the shoreline at Pyramid Rock and Fort Hase Beach are native coastal strand vegetation such as naupaka (*Scaevola taccada)*. The existing non-native vegetation consists of planted landscape material (typically turf grasses such as Bermuda grass [*Cynodon dactylon*], as well as a variety of native and non-native planted trees and shrubs) and non-native plants such as koa haole (*Leucaena leucocephala*), kiawe (*Prosopis pallida*), and Guinea grass (*Megathyrsus*

maximus) shrubland. There are no known occurrences of plants proposed or listed as threatened or endangered under the ESA within the affected area.

Hinahina kahakai (*Nama sandwicensis*), which is found on the sand dunes overlooking Pyramid Rock Beach, and maiapilo (*Capparis sandwichiana*), which grows on the ʻaʻā lava flows near the Pali Kilo beach cottages (west of the proposed G/ATOR Pad), are State Species of Conservation Concern.

Wildlife

Wildlife, including birds (i.e., seabirds, shorebirds, waterbirds, and passerines), reptiles, non-native mammals, and invertebrates found in the affected area are consistent with those found in a developed and urbanized coastal environment on Oʻahu. Invasive species at MCB Hawaii Kaneohe Bay include Cattle Egret (*Bubulcus ibis*), domestic/feral cats (*Felis catus*), rats (*Rattus* spp.), mongoose (*Herpestes javanicus*), and yellow crazy ant (*Anoplolepis gracilipes*). Many non-MBTA and non-ESA listed birds are common within the affected area such as the Common Myna (*Acridotheres tristis*), Zebra Dove (*Geopilia striata),* and Rock Pigeon (*Columba livia*). Many birds present in the Hawaiian Islands, and all resident seabirds, are protected under the MBTA. Ducks observed at MCB Hawaii Kaneohe Bay are the MBTA-listed Mallard (*Anas platyrhynchos*) and Hawaiian Duck-Mallard hybrid (koloa moali, *Anas wyvilliana*) and are not protected under ESA (the ESA-listed Hawaiian Duck is rare due to hybridization) (see Table 3.5-1) (L. Bookless, personal communication, August 24, 2023). MBTA-listed birds with the potential to occur in the area are listed in Table 3.5-1 and are identified by their common name, Hawaiian name, and status of presence within proposed action locations.

3.5.1.2 MCTAB

Vegetation

MCTAB is located within a highly maintained land management unit consisting of an inactive runway and maintained turf. Much of the vegetation is non-native terrestrial landscaping; however, native coastal and beach strand vegetation occurs along the shorelines. There are few naturally occurring native plant species on MCTAB, although some native species have been planted for landscaping. Existing non-native vegetation communities include ironwood (*Casuarina equisetifolia*) forests*,* koa-haole/Christmas berry shrublands, koa-haole shrublands, mangroves, and pickleweed (*Batis maritima*) flats. There are no known occurrences of plants proposed or listed as threatened or endangered under the ESA within the training area.

Wildlife

The area consists of four terrestrial habitat types that attract wildlife: wetlands, second-growth forests, shrubland, and turf areas. Invasive and feral wildlife such as mongoose, cats, rodents, and pigs have been sighted on MCTAB. Twenty-one species of birds have been observed near MCTAB at Bellows Air Force Station, including three migratory shorebirds, one native waterbird, and 17 introduced land birds (Air Force Civil Engineer Center [AFCEC], 2010) (see Table 3-5.1). Waimānalo Stream runs through the training areas and is a designated Fish and Wildlife Conservation Area and an established wildlife sanctuary.

3.5.1.3 Pu‘uloa RTF

Vegetation

Pu‘uloa RTF is an entirely built and modified landscape with no notable ecological communities on or adjacent to the property. The area was cleared with heavy equipment and lacks native vegetation cover. There are a few scattered native species on the beach, and landscaping consists of non-native trees, shrubs, and grasses that are irrigated and maintained in developed areas. Vegetation characteristic of this general area is open tropical dry forest. Observed native shoreline vegetation includes naupaka, pōhuehue (*Ipomea pres-caprae*), ‘aki‘aki grass (*Sporobolus virginicus*), and milo (*Thespesia populnea*). Non-native vegetation generally consists of scattered kiawe, opiuma (*Pithecellobium dulce*), ironwood, koa haole, pickleweed, buffel grass (*Cenchrus ciliaris*), and fingergrass (*Chloris* spp.). There are no known occurrences of plants proposed or listed as threatened or endangered under the ESA within the Pu‘uloa RTF.

Wildlife

A variety of non-native mammals, reptiles, and birds occur at Pu‘uloa RTF including feral cats, rats, cane toad (*Bufo marinus*), and Cattle Egret. Efforts to eradicate the invasive coconut rhinoceros beetle (*Oryctes rhinoceros*) are implemented on-site (removal of trees attacked by the beetle). The Pacific Golden Plover (*Pluvialis fulva*) is a commonly observed resident within the open grass areas, while several other indigenous migratory shorebirds can infrequently be seen on the grass and the shoreline, including Wandering Tattler (‘ulili, *Tringa incana*), Ruddy Turnstone (*Arenaria interpres*), and Sanderling (hunakai, *Calidris alba*) (Table 3.5-1) (MCB Hawaii, 2019). All of these birds are protected by the MBTA. Table 3-5.1 lists the MBTA species observed at Pu‘uloa RTF.

3.5.1.4 Special-status Species – Federal

ESA-listed species with the potential to occur in the affected area at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF are listed in Table 3.5-2 and are identified by their common name, Hawaiian name, regulatory status, and status of presence within the affected area. The text below provides additional context for the species listed in Table 3.5-2. Programs implemented under the INRMP and the Bird/Wildlife Aircraft Strike Hazard (BASH) Plan are currently in place to protect and monitor protected species (MCB Hawaii, 2023a). MCB Hawaii Order 1500.9C has specific guidance for avoidance of species at all three training areas during training activities. There is no federally designated critical habitat for any ESA-listed species on, or close to, the affected areas.

Waterbirds. The Hawaiian Duck is not likely to occur at MCB Hawaii Kaneohe Bay, MCTAB, or Pu‘uloa RTF. At MCB Hawaii Kaneohe Bay, the Percolation Ditch Wetland (northern region of Nu‘upia Ponds) provides habitat for ESA-listed waterbirds. The Percolation Ditch Wetland is utilized by both the Hawaiian Coot and Hawaiian Gallinule, and both are known to nest along the northern border adjacent to the affected area (L. Bookless, personal communication, August 24, 2023). The Hawaiian Coot populations at MCB Hawaii Kaneohe Bay have increased in recent decades and have returned to historic levels, with activity observed primarily at the Nu‘upia Ponds. An average of 20 Hawaiian Gallinules have been documented annually at the Nu‘upia Ponds. Hawaiian Coots nest primarily in fresh or slightly brackish shallow water with robust wetland plants, while Hawaiian Gallinules construct floating nests in freshwater with dense vegetation. The Hawaiian Coot and Hawaiian Gallinule are rarely observed within developed regions of the base (MCB Hawaii, 2023a).

Table 3.5-1 MBTA-Listed Species Known to Occur or with Potential to Occur in the Affected Area

Scientific Name	*Common Name*	*Hawaiian Name*	*Status of Species Presence*		
			MCB Hawaii Kaneohe Bay	*MCTAB**	*Pu‘uloa RTF**
Anas platyrhynchos	Mallard	-	Present	Present	Not Present
Anas wyvilliana	Hawaiian Duck-Mallard hybrid	Koloa moali	Present	Present	Not Present
Nycticorax nycticorax	Black-Crowned Night Heron	‘Auku‘u	Present	Potential	Not Present
Bubulcus ibis	Cattle Egret	-	Present	Potential	Potential
Fregata minor palmerstoni	Great Frigatebird	‘Iwa	Present	Potential	N/A
Puffinus pacificus	Wedge-Tailed Shearwater	‘Ua‘u kani	Present	Potential	N/A
Phoebastria immutabilis	Laysan Albatross	Mōlī	Present	Potential	N/A
Bulweria bulwerii	Bulwer’s Petrel	‘Ou	Present	Potential	N/A
Arenaria interpres	Ruddy Turnstone	‘Akekeke	Present	Potential	Present
Sula sula	Red-Footed Booby	‘Ā	Present	Potential	Not Present
Sula leucogaster	Brown Booby	‘Ā	Present	Potential	N/A
Anous minutus	Black Noddy	Noio	Present	Potential	N/A
Onychoprion fuscatus	Sooty Tern	‘Ewa‘ewa	Present	Potential	N/A
Onychoprion lunatus	Grey-Backed Tern	Pakalakala	Present	Potential	N/A
Phaethon lepturus	White-Tailed Tropicbird	Koa‘e kea	Present	Potential	N/A
Tyto alba	Common Barn Owl	-	Present	Potential	N/A
Cardinalis cardinalis	Northern Red Cardinal	-	Present	Potential	Potential
Haemorhous mexicanus	House Finch	-	Present	Potential	Potential
Pluvialis fulva	Pacific Golden Plover	Kōlea	Present	Potential	Present
Tringa incana	Wandering Tattler	‘Ūlili	N/A	N/A	Present
Calidris alba	Sanderling	Hunakai	N/A	N/A	Present
Numenius tahitiensis	Bristle-Thighed Curlew	Kioea	Present	Potential	N/A

Notes: Potential = bird presence has been observed near to the affected area, no confirmed observation within; Present = confirmed presence within the affected area; Not Present = surveys have not indicated presence, or unsuitable habitat. *Bird surveys have not been conducted at MCTAB or Pu‘uloa RTF locations. Species with N/A have not been observed and their likelihood to occur cannot be determined.

Legend: MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; N/A = Not Applicable; RTF = Range Training Facility.

Source: MCB Hawaii, 2022b; L. Bookless, personal communication, August 24, 2023.

Table 3.5-2 Special-status Species Known to Occur or with Potential to Occur in the Affected Area

Scientific Name	*Common Name*	*Hawaiian Name*	*Regulatory Status*	*MCB Hawaii Kaneohe Bay*	*MCTAB**	*Pu'uloa RTF**
Birds						
Fulica alai	Hawaiian Coot	ʻAlae keʻokeʻo	FE, SE	Present	Present	Not Present
Gallinula galeata sandvicensis	Hawaiian Gallinule	ʻAlae ʻula	FE, SE	Present	Present	Not Present
Himantopus mexicanus knudseni	Hawaiian Stilt	ʻAeʻo	FE, SE	Present	Present	Not Present
Oceanodroma castro	Band-Rumped Storm Petrel	ʻAkē ʻakē	FE, SE	Potential	Potential	Potential
Pterodroma sandwichensis	Hawaiian Petrel	ʻUaʻu	FE, SE	Potential	Potential	Potential
Puffinus auricularis newelli	Newell's Shearwater	ʻAʻo	FT, ST	Potential	Potential	Potential
Asio flammeus sandwichensis	Hawaiian Short-Eared Owl	Pueo	SE*	Present	Potential	Potential
Gygis alba	White Tern	Manu o kū	ST	Present	Potential	Present
Terrestrial Mammals						
Lasiurus cinereus semotus	Hawaiian hoary bat	ʻŌpeʻapeʻa	FE, SE	Present	Present	Present
Arthropods						
Danaus plexippus	Monarch butterfly	-	C	Present	Potential	Potential
Hylaeus anthracinus	Anthricinan yellow-faced bee, Hawaiian yellow-faced bee	Nalo meli maoli	FE, SE	Present	Not Present	Not Present
Marine Mammals						
Neomonachus schauinslandi	Hawaiian monk seal	ʻIlioholoikauaua	FE, SE	Present	Present	Present
Marine Reptiles						
Chelonia mydas	Green sea turtle	Honu	FT, ST	Present	Present	Present

Notes: Selections for Listing Status Column include: C = candidate species for ESA listing; FE = federal endangered; SE = state endangered; FT = federally threatened; ST = state threatened. Potential = bird presence has been observed near the affected area or is reasonable to assume utilization, no confirmed observation within; Present = confirmed presence within the affected area; Not Present = surveys have not indicated presence, or unsuitable habitat.
*Bird surveys have not been conducted at MCTAB or Pu'uloa RTF locations.
*The pueo is state listed as endangered only on the island of Oʻahu.

Legend: MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; RTF = Range Training Facility.

Source: MCB Hawaii, 2022b; L. Bookless, personal communication, August 24, 2023.

Hawaiian Stilts can be found along shoreline, estuarine, and freshwater habitats, as well as in grassy areas of developed regions on MCB Hawaii Kaneohe Bay, and have been observed in the affected areas, particularly when ponding occurs on grassy or developed surfaces. At Pollock Field, where Project #2 would be constructed, the Hawaiian Stilt has been observed foraging and loafing. The Hawaiian Stilt has been observed at the Percolation Ditch Wetland adjacent to the affected area, but is a rare visitor at this location (L. Bookless, personal communication, August 24, 2023). Due to the proximity of wetlands where waterbird nesting occurs, ESA-listed waterbird presence within the affected areas is likely. At MCTAB, the listed waterbird species have primarily been observed along Waimānalo Stream and wetland areas within the training area. Hawaiian waterbirds have not been documented at Pu‘uloa RTF, and suitable habitat does not exist.

Seabirds. The endangered Hawaiian Petrel (‘ua‘u*, Pterodroma sandwichensis*), threatened Newell’s shearwater (*‘a‘o*, *Puffinus auricularis newelli*), and band-rumped storm petrel (‘akē ‘akē, *Oceanodroma castro*) have the potential to transit over MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF (MCB Hawaii, 2023a). None of these seabird species have been detected or observed in the affected area. Sound meter surveys conducted in 2016 and 2017 detected Newell’s shearwater in both the Wai‘anae and Ko‘olau Mountains, and the Hawaiian Petrel in the Wai‘anae Mountains (MCB Hawaii, 2023a). Because of this, these seabird species may fly within the affected area as they move from the mountains to the ocean to forage for food. The Newell’s shearwater is known to utilize waters offshore of MCTAB, but is not common (AFCEC, 2010).

Hawaiian Hoary Bat. On MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF, the endangered Hawaiian hoary bat (‘ōpe‘ape‘a, *Lasiurus cinereus semotus*) has been detected on a transitory basis, but no roosting sites have been identified. They are a nocturnal species that roosts solitarily during the day (except mothers and pups) in native and non-native trees and forage along the edges of forest and within shrublands and open spaces, including pastures, roadways, forest gaps, and over areas of fresh/brackish water as well as open saltwater (MCB Hawaii, 2023a). Surveys completed in 2021 at all three training areas detected bats during August through December, which overlaps with the reproductive season, but foraging activity was rarely observed (Pinzari et al., 2021). While the Hawaiian hoary bat does transit and forage at all three training areas, overall presence was low (Pinzari et al., 2021). Despite low detection rates, the proposed facilities construction project locations at MCB Hawaii Kaneohe Bay are used by foraging bats and some locations may harbor suitable roost habitat (Pinzari et al., 2021).

Monarch Butterfly. The monarch butterfly (*Danaus plexippus*) is currently a candidate for federal listing and is seen in the affected area in search of desired vegetation such as crown flower (*Calotropis gigantea*). On MCB Hawaii Kaneohe Bay, eight crown flower plants occur near affected areas proposed for the G/ATOR Pad and Warehouse, as well as at the Klipper Golf Course (outside of the affected area). There are butterflies near the entry kiosk of MCTAB and crown flower near Waimānalo Stream. There have been no observations of the monarch butterfly at Pu‘uloa RTF.

Hawaiian Yellow-faced Bee. The Hawaiian yellow-faced bee (nalo meli maoli, *Hylaeus anthracinus*) is known to occur in coastal regions of O‘ahu in narrow rocky corridors along the shoreline (Magnacca and King, 2013). On MCB Hawaii Kaneohe Bay, populations have been documented along Pyramid Rock and North Beach shorelines, north of the proposed G/ATOR Pad component, approximately 400 feet from the affected area (Magnacca, 2017). Recently, much of the bee habitat in that area has been marked and fenced off to prevent disturbance to bee habitat. Additionally, assault lanes have been established with posts and chains to prevent inadvertent use of bee habitat areas for training activity (L. Bookless,

personal communication, August 24, 2023). There have been no observations of the Hawaiian yellow-faced bee at MCTAB or Pu'uloa RTF.

Green Sea Turtle and Hawaiian Monk Seal. On MCB Hawaii Kaneohe Bay, Hawaiian monk seals and green sea turtles haul-out on beach areas, including Pyramid Rock, North Beach, and Fort Hase Beach. Green sea turtle nesting occurs at North Beach. On rare occasions, olive ridley turtle nesting has occurred at Pyramid Rock Beach (MCB Hawaii) but is unlikely to occur; neither hawksbill turtle nor olive ridley turtle species have been observed nesting at MCTAB. Green sea turtles have been confirmed to haul-out at MCTAB, and both green sea turtles and monk seals have been confirmed to haul-out on the Pu'uloa RTF shoreline.

3.5.1.5 Special-status Species – State

Hawaiian Short-Eared Owl. The endemic land-dwelling Hawaiian Short-Eared Owl or pueo (*Asio flammeus sandwichensis*) is state-listed as endangered on O'ahu and has been documented throughout the Mōkapu Peninsula, as well as near affected areas at MCB Hawaii Kaneohe Bay. The vegetation around Nu'upia Ponds provides suitable nesting habitat for this ground-nesting raptor, and it has been observed traversing, nesting, and foraging there (MCB Hawaii, 2023a; Price Lab, 2022). At least seven pueos were estimated to utilize the base during the 2020–2021 breeding season, and it is likely the number of birds utilizing the area varies between seasons and from year to year (Price Lab, 2022). Based on observations during the same study, the resident population of pueo at MCB Hawaii Kaneohe Bay is likely to be three to four individuals (Price Lab, 2022). Nests are documented adjacent to the Project #3 affected area (L. Bookless, personal communication, July 13, 2022). Occasionally, juvenile pueo have been observed loafing around the northern perimeter of Nu'upia Ponds (L. Bookless, personal communication, August 24, 2023). The pueo may traverse MCTAB and Pu'uloa RTF, but no observations have been recorded during surveys (Price Lab, 2022; MCB Hawaii, 2019).

White Tern. Suitable habitat for the state-listed threatened White Tern (*Gygis alba*) exists outside the project footprints within the affected area at MCB Hawaii Kaneohe Bay and the species has been observed in flight, but no nesting sites have been found (L. Bookless, personal communication, August 24, 2023). White Terns may also occur at the MCTAB training site. White Terns have recently been documented nesting at Pu'uloa RTF, as suitable trees exist on site for the species to nest (L. Bookless, personal communication, August 24, 2023). White terns nest year-round in mature, open-canopy trees; with two peaks in egg-laying occurring in March and October (VanderWerf and Downs, 2018).

3.5.2 Environmental Consequences

The environmental consequences section below describes the impacts of the No-Action Alternative, facilities alternatives, and operational alternatives to vegetation and wildlife at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF. Sections 3.5.2.4 and 3.5.2.5 present an overview of impacts to federal and state special-status species for all three locations. A detailed analysis of ESA-listed species is in the Final Biological Assessment (Appendix D).

3.5.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur and there would be no change to biological resources.

3.5.2.2 Facilities Alternatives

Preferred Facilities Locations

Vegetation

The preferred facilities construction components identified in Section 2.2.2.1 would collectively result in the conversion of approximately 3 acres of existing landscaped vegetation to impervious surfaces. Vegetated portions of the affected area consist of mostly planted landscape material; no notable ecological communities occur on or adjacent to the construction sites. Site preparation and construction activities would involve the clearing of non-native shrubs and grasses. Vegetation restoration would include ground preparation, planting, temporary irrigation, and maintenance. Restored turf grass vegetation would be installed over a bio-degradable erosion-control fabric and would incorporate at least 50% native plant species. To prevent human-made erosion over time, landscape treatment would consist of planting, protective fencing, and walkways. The BMPs in Table 2-4, such as bioretention, vegetated swales, and pervious pavement, would manage stormwater volumes and avoid any potential flooding or ponding at and near the affected area. Therefore, there would be minimal change to the type and volume of water affecting vegetation in the affected area. Proposed native plant vegetation restoration and landscape repair and potential diversion features incorporated to the extent possible to increase flow of stormwater to nearby wetlands would result in minor beneficial impacts to vegetation in the affected area. For these reasons, the preferred facilities construction component would have less than significant impacts to vegetation.

Wildlife

Impacts identified for birds generally apply to all species present. Unique impacts specific to individual species or groups of birds are further detailed where applicable. The impact analysis below details the following "stressors" that can affect wildlife: habitat, water quality, fallout/disorientation, strike, and noise disturbance. A collective impact conclusion is presented at the end of this subsection.

Habitat. Approximately 3 acres of disturbed, manicured/landscaped vegetation would be cleared and developed into impervious ground cover or facilities. The proposed new impervious surfaces impact only landscaped areas that currently provide minimal habitat for ground-nesting and foraging bird species. There are few shrubs or trees in the affected area that provide suitable habitat for wildlife. Impacts to wildlife species (primarily birds and lizards) would be minimal as existing species are mobile, and similar low-quality habitat is plentiful and easy to access. If disturbed by construction, wildlife would be able to temporarily leave the immediate area of construction and find similar habitat nearby on the installation.

Water Quality. Standing water attracts birds such as waterbirds and Cattle Egrets. To minimize this attraction, construction activities would be managed to avoid creating temporary ponding in the affected area, including covering stormwater detention basins. Construction activities would comply with NPDES permit requirements and the existing Storm Water Management Plan (MCB Hawaii, 2023b), thereby minimizing impacts to water quality. In addition, BMPs such as the use of bioretention techniques, vegetated swales and filter strips, and retention basins would further minimize impacts.

Fallout/Disorientation. Seabird fallout can occur when unnatural lighting at night attracts and disorients birds to areas that may place them in dangerous conditions leading to their injury or death, as well as increased risk for potential bird aircraft strikes. Many bird species are attracted to facilities with lights, so lighting use during nighttime construction is a potential stressor to nocturnal or light-sensitive seabird species. To minimize this potential impact, construction is proposed for daytime hours. If limited,

unplanned nighttime construction must occur, or lighting is required for safety during non-construction hours, all exterior lights would meet or exceed MCB Hawaii, USFWS, National Oceanic and Atmospheric Administration (NOAA), and/or International Dark-Sky Association standards for exterior lighting and the type of work to be undertaken. Additional BMPs to further reduce risk of fallout (see Table 2-4) include use of tinted windows, elimination of lighting on the top of buildings, and relocating lights as close to the ground as possible. In addition, all on-site contractors would be briefed on how to conduct construction in the presence of light-attracted bird species (L. Bookless, personal communication, March 6, 2022).

Strike. There is a very slight risk of injury or death to birds due to vehicle or equipment collisions during construction. BMPs described above to prevent temporary ponding and excess lighting would minimize attraction of birds to the construction area thereby minimizing risk of strike.

Noise Disturbance. Construction-related noise may temporarily displace wildlife from habitat in the immediate vicinity of the affected area; however, the habitat in the affected area consists of mostly developed and landscaped area. In addition, construction would be temporary and would occur in previously developed and actively used areas where machinery is in regular use. In these construction areas, birds have either adapted to the general noise of the construction areas or would temporarily relocate from the construction areas to adjacent habitats.

For the reasons described above, the preferred facilities construction component would have less than significant impacts to wildlife.

Alternate Facilities Locations

Vegetation

Under this alternative, alternate facilities locations would primarily involve reuse and renovation of existing facilities, and there would be minimal construction. Only Projects 2 and 3 would involve ground disturbance and construction. Project 2 construction would occur in a developed area and would only alter existing landscaped vegetation occurring in that area. The Motor Pool Wetland is west of the 1/12 Gun Park, and a Wildlife Management Area is across Mōkapu Road; however, construction would only occur within the 1/12 Gun Park area and would not affect the wetland or Wildlife Management Area. In addition, site preparation, landscaping, and design features described above and shown in Table 2-4 would also be implemented for the alternate facilities locations. For these reasons, the alternate facilities construction component would have less than significant impacts to vegetation.

Wildlife

Project 2 construction would occur in a developed area and would only alter existing landscaped vegetation occurring in that area. As described above, Project 3 construction would not affect the wetland or Wildlife Management Area. These projects are in locations similar to the preferred facilities locations, so the analysis of stressors above would apply to the alternate facilities locations. For these reasons, the alternate facilities construction component would have less than significant impacts to wildlife.

3.5.2.3 Operational Alternatives

Alternative 1

Vegetation

Training with the modernized equipment would occur in the same locations and be the same type and have the same tempo as current ground-based training. Proposed training activities would not expand the available training areas at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF or involve impacts to new areas. Training with modernized equipment would occur at the same locations within the three training areas where ground-based training and other activities currently occur, and the proposed training activities are similar to existing activities. This includes routine vegetation maintenance and ground training in established training locations. All training activities occurring on vegetated areas would adhere to procedures established in MCB Hawaii Order 1500.9C to reduce potential impacts to terrestrial biological resources. Therefore, Alternative 1 training would have less than significant impacts to vegetation at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF.

Wildlife

As noted previously, Alternative 1 training would be similar to existing training at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF for type, tempo, and areas of training. As such, it would be conducted pursuant to the same procedures including the INRMP program and MCB Hawaii Order 1500.9C designed to minimize any impacts to wildlife. More specifically, Chapter 2 of this order includes specifications for environmental coordination, identification of environmental constraints, and identification of off-limits areas and prohibited activities, including:

- How to manage and report fuel spills or hazardous materials incidents.
- Coordinating with ECPD.
- Avoiding damage to beach foliage, sand dunes, vegetated cover along shorelines, trees, and shrubbery by transiting on existing roadways and trails.
- Parking only in authorized areas.
- Avoiding the following activities except where previously approved:
  - Disposing of trash, explosive material, or hazardous materials/waste;
  - Draining of oil, fuel, or hazardous materials onto the ground or into the water;
  - Removal or intentional destruction of plants, trees, brush, or other vegetation;
  - Killing, injuring, or harassing wildlife;
  - Use of detergents or chemicals for cleaning/maintain vehicles and equipment; and
  - Use of live ordnance without MCB Hawaii approval.
- Avoiding off-limit areas:
  - Wetlands at MCB Hawaii Kaneohe Bay and MCTAB;
  - Waimānalo Stream; and
  - State of Hawai'i or private property.

Training would involve vehicles accessing a location within one of the three training areas, using established vehicle paths and/or approved areas to move from one location to another, setting up the equipment in a particular location, operating the equipment in that area, and then demobilizing and

moving either to another location within the training area or back to MCB Hawaii Kaneohe Bay. In some cases, the personnel would bivouac (stay overnight) at the location as part of the training.

Habitat. Many non-listed and MBTA-listed birds occur in the affected area. As noted above, Marine Corps ground-based forces would train in a similar manner to how they currently train at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF and would continue to follow procedures identified in Chapter 2 of the MCB Hawaii Order 1500.9C, including requiring no training within or adjacent to Waimānalo Stream and a 100-yard buffer zone around the mouth of the stream. Proposed training with modernized equipment would occur on existing trails and areas currently used for ground-based training at these locations, with no additional habitat disturbance at any of the three training areas. As such, proposed training with modernized equipment would not alter, degrade, or reduce the amount of habitat at any of the three training areas.

Water Quality. Possible operational impacts to water are increased ponding on developed surfaces and contamination of water sources frequented by birds or mammalian species. With regard to ponding, applicable LID techniques such as vegetated swales established during construction at MCB Hawaii Kaneohe Bay would remain beyond the construction period (see Table 2-4 for complete water-related BMPs). Regarding possible contamination of water resources, design features would capture and contain any potential spills from facilities operations to prevent water contamination. Additional LID features for water management beyond the construction period (see Table 2-4) would be implemented to further minimize potential pollutants entering stormwater flows. In addition, training with modernized equipment at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF would be similar to current ground-based training and would continue to adhere to procedures in MCB Hawaii Order 1500.9C. This includes no training occurring within or adjacent to Waimānalo Stream or in a 100-yard buffer zone around the mouth of the stream.

Fallout/Disorientation. Fallout could occur from operational lighting in the affected area of MCB Hawaii Kaneohe Bay (no operational lighting would occur at MCTAB or Pu'uloa RTF). Equipment to reduce fallout includes installation of down-shielded lights, tinted windows, and a full cutoff feature that minimizes backlight, uplight, and glare. Exterior lighting would follow MCB Hawaii "WILDLIFE FRIENDLY LIGHTING" standards (MCB Hawaii, 2022a) (see Table 2-4 for complete lighting BMPs). Training would avoid operations requiring artificial nighttime lighting.

Strike. There is little to no risk of strike to wildlife (such as birds in flight) associated with training at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF. The training would be virtually identical to training conducted with existing equipment, with, among the other requirements in 1500.9C, limiting vehicles operating speeds to no greater than 15 miles per hour.

Noise Disturbance. Training with modernized equipment at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF is not likely to cause behavioral disturbance to wildlife due to noise. Studies have shown that birds can habituate to noise following frequent exposure and cease to respond behaviorally to the noise (Larkin et al., 1996; National Park Service, 1994; Plumpton, 2006). Individuals exposed to noise would return to normal behaviors almost immediately after exposure (Navy, 2018). Natural resources staff conduct bird counts three times annually, and numbers are consistent from year to year. These data support the conclusion that noise from training does not currently result in population decline nor impact breeding or nesting success of resident bird species (L. Bookless, personal communication, June 21, 2022). Because wildlife species would be exposed to the same type of noise, at the same tempo, and

in the same areas as existing training at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF, there would be no change to noise exposure to wildlife resulting from Alternative 1.

For the reasons described above, Alternative 1 training would have less than significant impacts to wildlife at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF.

Alternative 2

The analysis presented above for Alternative 1 training is applicable to Alternative 2 training, except that the training tempo would increase by 20%. This would amount to an average increase of three training events per week for MCB Hawaii Kaneohe Bay and MCTAB, and an increase of once a week for Pu'uloa RTF. As noted previously, this represents a relatively small change when considered on a daily and weekly basis. With a 20% increase in training tempo, there would be a minor increase in noise duration and risk of strike; however, there would be no increased impacts to habitat, water quality, or nighttime lighting (fallout/disorientation). As with Alternative 1, all training would comply with the INRMP and 1500.9C requirements specifically designed to ensure minimal impacts to vegetation and wildlife. Given the minimal daily and weekly change to the tempo of training, its similarity to existing conditions and Alternative 1 regarding type and location of training activities, and the requirements in the INRMP and 1500.9C to protect biological resources, Alternative 2 training would have less than significant impacts to terrestrial biological resources at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF.

3.5.2.4 Special-status Species – Federal

A summary analysis for each ESA-listed species is presented below for impacts associated with the facilities construction at MCB Hawaii Kaneohe Bay and training at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF. A detailed analysis of ESA-listed species is in the Final Biological Assessment (Appendix D).

ESA-listed birds. ESA-listed birds at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF would be subject to the same potential construction (MCB Hawaii Kaneohe Bay) and operational impacts (MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF) listed above for all birds. No unique stressors or risks have been identified for ESA-listed bird species. Therefore, the impact analysis described above is equally applicable to ESA-listed birds listed in Table 3.5-2. Natural resources staff conduct bird counts three times annually for ESA-listed birds and have found the numbers and species of ESA-listed birds are consistent from year to year, showing that existing training has not resulted in population decline nor impacted breeding or nesting success. In addition, at MCB Hawaii Kaneohe Bay there has been ongoing construction over the last several years with no observable population change (L. Bookless, personal communication, June 21, 2022). For these reasons, identical to impacts to wildlife discussed in Section 3.5.2.3, the facilities construction component and training may affect, but are not likely to adversely affect, ESA-listed bird species.

Hawaiian Hoary Bat. As discussed above, the affected area for facilities construction at MCB Hawaii Kaneohe Bay is mostly developed. Few trees are currently located at areas proposed for vegetation removal, and vegetation removal would be minimal. While the Hawaiian hoary bat has been documented on a transitory basis throughout MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF, and may forage within the affected area, no nests or roosts have been detected at any of the training areas (Pinzari et al., 2021; L. Bookless, personal communication, August 24, 2023). Sparsely occurring landscape trees are not suitable for Hawaiian hoary bats based on the lack of a closed canopy system, which Hawaiian hoary bats seek for protection from environmental factors (i.e., rain, wind, and sun). If tree trimming/removal is required, it would be done outside of the hoary bat pupping season (1 June–15

September). Hoary bats would be subject to the same potential construction and training impacts as listed above for birds. While bats are sensitive to noise, there would only be a minor increase in construction noise at MCB Hawaii Kaneohe Bay and no increase in training noise at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF for Alternative 1, with only a slight immeasurable increase for Alternative 2. Any increases in noise duration as a result of current or increased training levels would not introduce sounds or volumes differing from existing training that occurs at these locations. Additionally, bats have not been detected roosting near the affected area where any increases in training would occur. Hence, Alternative 2 would not result in a noticeable change to the acoustic environment for any bats that might potentially be impacted by this noise. BMPs detailed above for regulation of artificial lighting, as well as those measures targeting sediment control to reduce negative impacts from airborne particles during construction, would further reduce potential impacts to bats. Per Table 2-4, proposed fencing would minimize use of barbed wire fencing with the goal of achieving no net gain in barbed wire fencing. Approximately 2,000 linear feet of security fencing at Project 1 would potentially include 3-strand barbed wire fencing. However, there is currently barbed wire fencing at this location, and this would not be a substantial increase in total barbed wire fencing. BMPs to avoid adverse impacts during the pupping season are detailed in Table 2-4. For these reasons, the facilities construction component and training may affect, but are not likely to adversely affect, the Hawaiian hoary bat.

Monarch Butterfly. Known host plants (crown flower bushes) are planted at the MCB Hawaii Kaneohe Bay ECPD building on the north side of the runway near Mōkapu Road, near the proposed G/ATOR Warehouse project component, and within 900 feet of the proposed G/ATOR Pad component. Host plants are not at or near the location of ground disturbance for Project #8 construction, so they would not be affected. Monarch butterflies have been observed traversing the affected area at MCB Hawaii Kaneohe Bay and at the entry to MCTAB to reach desired vegetation outside of the affected area. The risk of monarch butterfly strike would not be increased from current conditions, as training with modernized equipment would be virtually identical to training conducted with existing equipment. No training would occur within or adjacent to Waimānalo Stream at MCTAB where crown flower occurs. There have been no observations of monarch butterfly at Pu'uloa RTF. For these reasons, the facilities construction component and training would have no effect on the monarch butterfly.

Hawaiian Yellow-faced Bee. A large population of Hawaiian yellow-faced bees is known to exist in the coastal regions north of the affected area at MCB Hawaii Kaneohe Bay. The Hawaiian yellow-faced bee is known to generally occur no further than 100 meters from the shoreline (L. Bookless, personal communication, August 24, 2023). Suitable habitat along vegetated sand dunes is near the proposed G/ATOR Pad; however, no construction or new training is planned along the shoreline that would affect potential habitat for the Hawaiian yellow-faced bee. Additionally, bee habitat has recently been marked with posts and chains to prevent recreational or training activities from disturbing such areas (L. Bookless, personal communication, August 24, 2023). There have been no observations of the Hawaiian yellow-faced bee at MCTAB or Pu'uloa RTF. For these reasons, the facilities construction component and training would have no effect on the Hawaiian yellow-faced bee.

Hawaiian Monk Seal and Green Sea Turtle. Hawaiian monk seals and green sea turtles occasionally haul-out on the beaches at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF. MCB Hawaii Order 1500.9C has specific guidance for avoiding impacts to these species. Should a monk seal or sea turtle be discovered "beached" within any shoreline training area at MCB Hawaii Kaneohe Bay, MCTAB, or Pu'uloa RTF, all activity within 150 feet must cease. The training unit must immediately notify Range Control about the presence of the animal who then notifies MCB Hawaii Natural Resources. Current

ground-based training conducted at these locations follows this guidance to avoid potential impacts to those species when present on the beach. Ground-based training with modernized equipment would be virtually identical to ground-based training currently conducted at these locations with legacy equipment. The Marine Corps would continue to follow MCB Hawaii Order 1500.9C guidance to avoid potential impacts to these species when present on the beach. In addition, if training with modernized equipment were to occur during non-daylight hours, the Marine Corps would follow lighting guidance identified in Table 2-4 to avoid the potential for impacts to green sea turtles while hauled out on the beaches or during nesting activities. For these reasons, the facilities construction component and training would have no effect on the Hawaiian monk seal and green sea turtle.

3.5.2.5 Special-status Species – State

Hawaiian Short-Eared Owl. There is suitable pueo foraging habitat in the affected area. The affected area, particularly the Project 2 and 3 components, are within the outer home range of pueos resident to Nu‘upia Ponds (MCB Hawaii, 2023a; Price Lab, 2022). To reduce risk to pueos in tall grasses, project construction and operational maintenance would adopt conservation measures that require halting any potentially harmful activity if nests, eggs, or chicks are observed. If adults, nests, or chicks are found and/or flushed out during construction or training activity, contractors must stop work and inform MCB Hawaii natural resources staff of the species’ presence (Price Lab, 2022). Noise effects to pueos would be the same as those described above for birds. There have been no observations of pueo at MCTAB or Pu‘uloa RTF. Therefore, the facilities construction component and training would have less than significant impacts to the pueo.

White Tern. There is suitable habitat within the affected area at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF, and nesting has been documented at Pu‘uloa RTF. To the maximum extent practicable, any tree trimming activities would avoid the peak egg-laying/nesting months (March and October) and nest surveys would be conducted prior to tree removal, pruning, or trimming activities. If the tree scheduled for removal, pruning, or trimming is found to contain a nest, the tree would not be disturbed until the chicks have fledged (approximately 48 days). Noise effects to white terns would be the same as those described above for birds. Therefore, the facilities construction component and training would have less than significant impacts to the white tern.

3.6 Public Health and Safety

Public health and safety evaluates whether the proposed action has the potential to affect the safety, well-being, or health of members of the public. Health and safety issues include impacts from noise (addressed in Section 3.1, *Noise*), potential water resources effects (addressed in Section 3.3, *Water Resources*), vehicle safety from vehicle convoy movements to and from training areas, and training safely with the modernized equipment.

3.6.1 Affected Environment

There are many common safety procedures that occur across the three training areas (MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF). The affected environment description below summarizes these key public health and safety elements that are applicable to all three training areas: SOPs, access, and the training activities themselves.

3.6.1.1 Standard Operating Procedures

Existing SOPs to protect public health and safety common to all Marine Corps training areas include:

- MCB Hawaii Order 1500.9C, *Standing Operating Procedures for Marine Corps Base Hawaii Ranges and Training Areas.* This Order consolidates and standardizes the procedures for the effective, efficient, and safe planning, scheduling, and execution of Marine Corps ground, logistics and aviation training on MCB Hawaii ranges. It also establishes the regulations necessary to ensure Marine Corps training is conducted and readiness is maintained while preserving life, equipment, and natural resources. More specifically, the Order requires:
  - A Range Control Officer be assigned for all training events to manage and oversee safety during training.
  - Establishing and implementing all feasible access controls to deter unauthorized access.
  - Conducting range safety training.
  - Publishing public notices in advance of training.
  - Implementing response procedures in the case of a release of hazardous materials during training.
  - Ensuring scheduling and safe operations for aviation training, including:
    - deconfliction of airspace for aviation training; and
    - procedures and flight paths for safe use of helicopter and tilt-rotor aircraft landing zones at MCB Hawaii Kaneohe Bay and MCTAB; identification of areas for aircraft to avoid to minimize BASH potential, in accordance with the BASH Plan (Marine Corps, 2011).
  - Ensuring safe operations for amphibious training, including:
    - submitting a Notice to Mariners to the U.S. Coast Guard in advance of training;
    - ensuring that no vehicles, non-participating watercraft, or unauthorized people are within 100 meters of moving watercraft;
    - training is conducted in accepted weather and surf conditions;
    - amphibious training equipment and personnel remain within designated locations for each event; and
    - restoring the beach sand to its original condition following each event.

  - Ensuring adherence to fire protection procedures.
- MCB Hawaii Order 3060.1, *Tactical Driving in Hawaii*, addresses vehicle convoys on O'ahu and provides procedures and requirements for military vehicle movement to ensure safe convoy movement of military vehicles throughout O'ahu (MCB Hawaii, 2020). This Order designates specific convoy routes, convoy timing, and techniques and procedures for convoy transportation to deconflict military transport from civilian traffic. Specific elements of the Order are listed in Section 3.7, *Transportation*.
- The MCB Hawaii Kaneohe Bay *Hazardous Waste Management Plan* governs the management of hazardous waste and describes specific responsibilities, requirements, and procedures for the management of all hazardous materials and waste. The plan specifically forbids any training in the vicinity of Installation Restoration Program sites.
- MCB Hawaii Order 3302.1 and the *Marine Corps Base Hawaii Integrated Wildland Fire Management Plan* (MCB Hawaii, 2021b) govern fire management and response protocols for all training activities. The protocols in the Order and Plan are directly incorporated into SOPs for use at Marine Corps training areas, and require the Range Control Officer to incorporate planning and response measures into each training event to prevent wildland fires at all training areas. MCB Hawaii also has a cooperative agreement with the Honolulu Fire Department for response to fires at the installation.
- Dahlgren Division, Naval Surface Warfare Center ltr. 8020 Ser. Q52/2665, controls the use of radar systems and provides hazardous electromagnetic radiation parameters for ordnance and personnel requiring all training to be conducted at minimum prescribed distances from military personnel, ordnance, and fuel to ensure safe operations of radar emitting systems. The existing systems used for ground-based training operate similarly to other navigational aids and radars at civilian airports and television weather stations throughout the U.S., emitting electromagnetic energy similar to that from cell phones, handheld radios, commercial radio stations, and television stations.

3.6.1.2 Access

Location. MCB Hawaii Kaneohe Bay is bounded by Kailua on the south and east and by Kāne'ohe on the south and west. MCTAB is bound on the south and west by Waimānalo, on the northwest by Kailua, and on the north by Lanikai. Pu'uloa RTF is bounded on the north by FAA property and undeveloped land; to the east by military privatized housing, an elementary school, and Iroquois Point residential community; to the south by the ocean; and to the west by 'Ewa Beach Park and the coastal portion of the Eva Beach residential community.

Public Access. The public is not allowed where training occurs at MCB Hawaii Kaneohe Bay and Pu'uloa RTF. No public access is allowed during training events at MCTAB; however, each weekend Training Area 1 is closed to military activities from noon Friday until 8 a.m. Monday to allow recreational use of the beach. MCB Hawaii notifies the public in advance of training activities at MCTAB and Pu'uloa RTF; MCB Hawaii Kaneohe Bay is an active military installation and does not engage in routine public notification for training occurring on base.

3.6.1.3 Training Activities

Training at all three training areas follows the procedures described above in Section 3.6.1.1 to ensure a safe training environment for the public. An overview of the types of training that occurs at each training area is summarized below:

- MCB Hawaii Kaneohe Bay. Various types of training occur at multiple areas within MCB Hawaii Kaneohe Bay boundaries (see Figure 1-3). This includes aviation training (at the airfield and at Boondocker Training Area), live-fire and explosives training at designated ranges at Ulupaʻu RTF, amphibious training (at Pyramid Rock, North Beach, and Fort Hase Beach), and ground-based training with legacy equipment (see Sections 2.1.1 and 2.1.3). Locations for ground-based training include Pyramid Rock, Ulupaʻu RTF, Fort Hase Beach, and Boondocker Training Area.
- MCTAB. MCTAB is used by Marines and other military services to conduct amphibious, helicopter, tilt-rotor aircraft, urban training, motorized exercises in conjunction with troop land maneuver training, and ground-based training with legacy equipment (see Sections 2.1.1 and 2.1.3). Landing zones and urban training locations are at and north of the airfield (see Figure 1-4), and amphibious training occurs at the beaches east of the airfield. No live-fire training occurs at MCTAB.
- Puʻuloa RTF. Puʻuloa RTF is a live-fire range complex for small arms training, qualification, and requalification for military, state agency, and federal agency training (see Figure 1-4). It is also used for ground-based training with legacy equipment (see Sections 2.1.1 and 2.1.3).

3.6.2 Environmental Consequences

3.6.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur and there would be no change to noise.

3.6.2.2 Facilities Alternatives

Preferred Facilities Locations

There would be no public access to the construction areas. Construction would occur in operational areas on the northern, central, and eastern areas of MCB Hawaii Kaneohe Bay during daylight hours. These construction areas are all located on base and at least 0.5 mile from the nearest community (Kailua), so no construction would occur in or near residential housing. All construction zones would be physically secured from and monitored for unauthorized entry, and appropriate measures would be employed to ensure that individuals are not able to gain access to any site during non-work hours. Given the location, limited scope of construction, and access controls, the preferred facilities construction component of Alternative 1 would result in less than significant impacts to public health and safety.

Alternate Facilities Locations

Under this alternative, alternate facilities locations would primarily involve reuse and renovation of existing facilities, and there would be minimal construction. The only construction that would occur would be for Projects 2 and 3, resulting in alternative facility locations having considerably less construction. The safety elements described above for the preferred alternative facilities construction component would be applicable to construction for Projects 2 and 3, resulting in the alternate facilities

construction component of alternative faculties locations having less than significant impacts to public health and safety.

3.6.2.3 Operational Alternatives

Alternative 1

Alternative 1 would not increase risks to public health and safety. Training with modernized equipment would occur in the same locations and be at the same type and tempo as current ground-based training. The Marine Corps would continue to follow existing training protocols identified in Section 3.6.1.1 ensuring emergency preparedness, hazardous waste and regulated non-hazardous waste management, airfield and helipad safety, BASH control, wildland fire prevention, and ordnance safety. The proposed action would not result in any increase of net explosive ordnance stored at MCB Hawaii Kaneohe Bay. Training with modernized equipment would not involve "live fire" activities at any training area. Existing training follows the procedures identified above in Section 3.6.1.3, including procedures for minimizing potential to affect environmental and cultural resources, procedures for vehicle convoys to/from the training areas, and procedures for wildland fire.

Off-base roadways would not be affected for training associated with modernized equipment at MCB Hawaii Kaneohe Bay because personnel and equipment would already be located on base. Roadway safety between MCB Hawaii Kaneohe Bay and the other two training areas (MCTAB and Pu'uloa RTF) would not change from existing conditions. As described in Section 3.7, *Transportation*, the amount of ground-based training vehicle traffic on roadways annually represents less than 1% of traffic volumes on any of the roadways leading to MCTAB and Pu'uloa RTF. This small amount does not substantially affect the potential for vehicle mishaps on these roadways. In addition, the Marine Corps would continue to adhere to MCB Hawaii Order 3060.1 (regarding convoy transportation).

Use of the modernized G/ATOR radar system would occur at MCB Hawaii Kaneohe Bay. Use of G/ATOR system radar and other radar systems would be similar to existing military and civilian radars currently used on O'ahu. This self-monitoring radar, which operates within Federal Communications Commission limits, automatically turns off if the system exceeds preprogrammed parameters to avoid harming personnel or the environment. Moreover, under no training event would the system be operated in the vicinity of the public. Therefore, operation of the G/ATOR would not create a risk of electromagnetic frequency exposure.

For these reasons, Alternative 1 training would have less than significant impacts to public health and safety.

Alternative 2

Alternative 2 would have a 20% increase in the number of training events annually with the modernized equipment. This would amount to an average increase of three training events per week for MCB Hawaii Kaneohe Bay and MCTAB and an increase of once a week for Pu'uloa RTF. This increased training would be conducted in accordance with existing procedures as identified for Alternative 1. This increase in tempo would represent an average of less than one additional vehicle convoy per week on roadways to MCTAB or Pu'uloa RTF (see Table 2-3). Even with this 20% increase in tempo, military vehicle convoy traffic would still represent less than 1% of all traffic on public roads leading to MCTAB and Pu'uloa RTF. The absence of any significant change to overall traffic on public roadways – even with a 20% increase in tempo – would not change the potential for vehicle mishaps. For these reasons, Alternative 2 training would have less than significant impacts to public health and safety.

3.7 Transportation

This discussion of transportation involves impacts of the proposed action to off-base roadways, bus routes, bikeways, and access routes into the project locations. The affected environment for transportation consists of the roadways between MCB Hawaii Kaneohe Bay and the two off-base training areas (MCTAB and Pu‘uloa RTF).

3.7.1 Affected Environment

The Marine Corps follows MCB Hawaii Order 3060.1, *Tactical Driving in Hawaii*, to ensure the safe movement of military vehicles throughout O‘ahu (MCB Hawaii, 2020). MCB Hawaii Order 3060.1 designates specific convoy routes, convoy timing, and techniques and procedures for convoy transportation to deconflict military transport from civilian traffic. Among other requirements, MCB Hawaii Order 3060.1:

- Prohibits the use of off-base public highways by military vehicles between 6 a.m. and 8 a.m. and 4 p.m. and 6 p.m. Monday through Friday.
- Establishes plans and route maps for transportation.
- Requires convoy safety briefs in advance of all training events.

The transportation network between MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF consists of interstates, highways, and local roadways. Figure 3.7-1 and Table 3.7-1 show the transportation network on O‘ahu between MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF. The main roads providing access to MCB Hawaii Kaneohe Bay include H-3 and Mōkapu Road. From MCB Hawaii Kaneohe Bay to MCTAB, the route is H-3 to HI-83 to HI-72. Kalaniana‘ole Highway (HI-72) is the main road that provides access to MCTAB, with one turn onto Tinker Road to access the gate at MCTAB. From MCB Hawaii Kaneohe Bay to Pu‘uloa, the route involves taking H-3 to H-1 and using Fort Weaver Road (HI-76). The main road that provides access to Pu‘uloa RTF is Fort Weaver Road (HI-76) which eventually turns into Cormorant Road near Pu‘uloa RTF.

Roadways near the individual training areas are shown in Figures 3.7-2 (MCB Hawaii Kaneohe Bay), 3.7-3 (MCTAB), and 3.7-4 (Pu‘uloa RTF).

3.7.1.1 MCB Hawaii Kaneohe Bay

Figure 3.7-2 shows the transportation network immediately outside the installation and the two access gates to the installation.

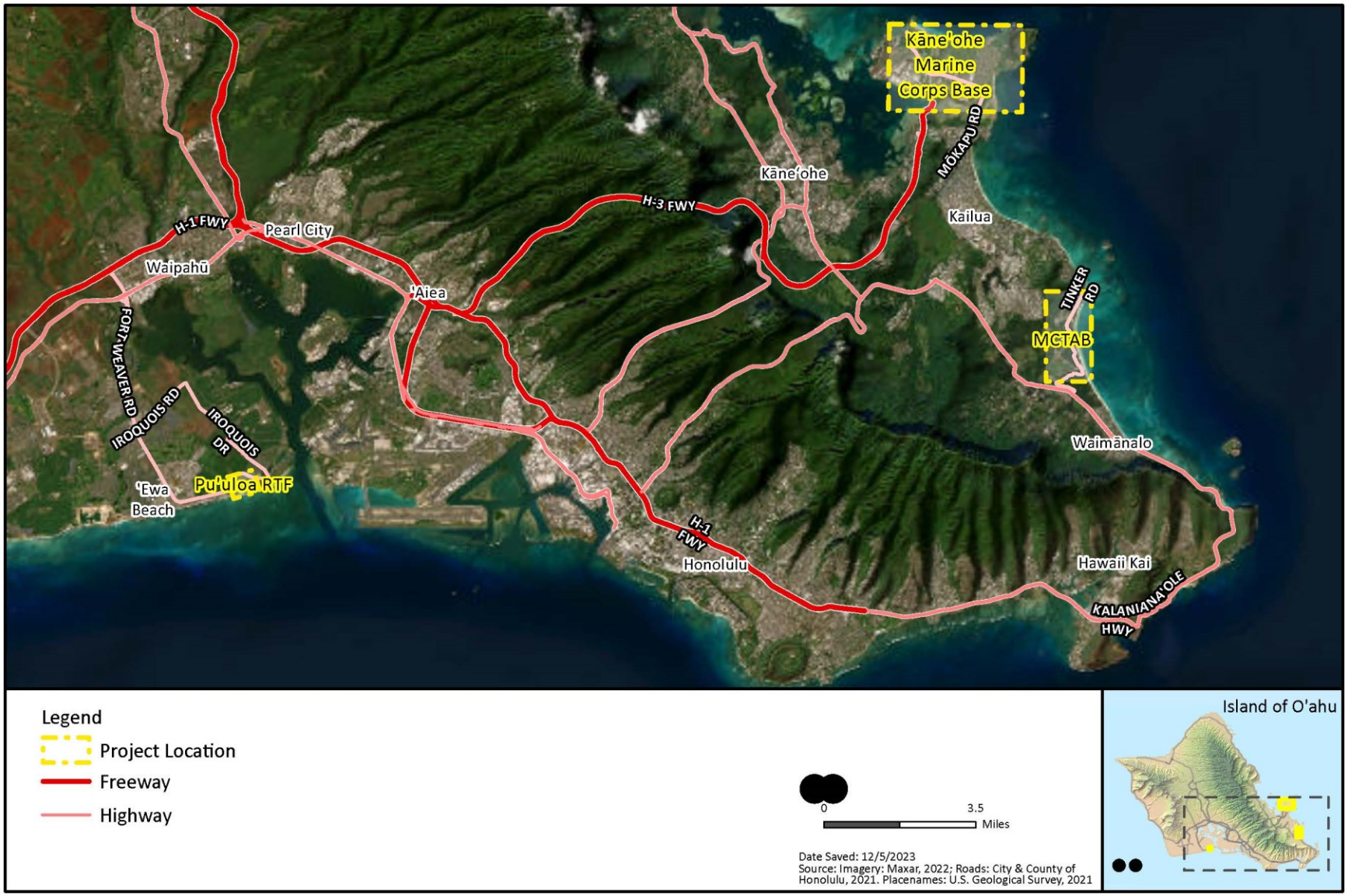


Figure 3.7-1 Roadways Between MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF

Table 3.7-1 External Roadway Characteristics

Roadway	*Description*	*Road Type*	*# of Lanes*	*2020 AADT (HDOT, 2023)[1]*
MCB Kaneohe Bay				
H-3	From Halawa, around Kāneʻohe, and to MCB Hawaii Kaneohe Bay	Interstate	Four – six (two-three in each direction)	14,800[2]
Mōkapu Road	North Kalaheo Ave to MCB Hawaii Kaneohe Bay	Major Collector	Four (two in each direction)	10,600
Mōkapu Blvd	North Kalaheo Avenue to Kāneʻohe	Principal Arterial	Four (two lanes in each direction)	10,600[3]
Kāneʻohe Bay Drive	North Kalaheo Avenue to Mōkapu Saddle Road	Major Collector	Two (one lane each direction)	9,700[4]
North Kalaheo Avenue	Mōkapu Road/Boulevard to Kailua Road	Major Collector	Two (one lane each direction)	13,400
MCTAB				
Kalanianaʻole Highway (72)	Keolu Drive to Inoaole Street	Principal Arterial	Two (one lane each direction)	14,300[5]
Tinker Road	Kalanianaʻole Highway (72) to MCTAB Gate	N/A	Two (one lane each direction)	N/A
Puʻuloa RTF				
Fort Weaver Road (76)	From Keoneula Boulevard to North Road	Principal Arterial	Four (two lanes in each direction) with turn pockets	20,600[6]
Fort Weaver Road (76)	From North Road to Kilaha Street	Principal Arterial	Four (two lanes in each direction) with turn pockets	6,200[7]
Fort Weaver Road (76)	From Kilaha Street to Popoi Place	Principal Arterial	Two (one lane each direction)	2,100[8]
North Road	Fort Weaver Road (Route 76)/Hanakahi Street (Route 7144)	Major Collector	Two (one lane each direction)	5,000[9]
West Loch Drive	From Iroquois Road to North Road	N/A	Two (one lane each direction)	N/A
Iroquois Road	Fort Weaver Road to West Loch Drive	Major Collector	Two (one lane each direction)	7,400[10]

Notes: [1]HDOT Federal-Aid Classification Update (HDOT, 2012). No updated guidance provided as this document was based on the 2010 census figures; AADT is a basic measurement that indicates vehicle traffic load on a road segment. AADT estimates the mean traffic volume across all days for a year for a given location along a roadway.
[2]Route H-3 Between MP 14.86 and 15.316 (HDOT, 2023).
[3]Route 65 Between MP 3.24 and 4.148 (HDOT, 2023).
[4]Route 6511 between MP 0.00 and 2.58 (HDOT, 2023).
[5]Route 72 Between MP 1.38 and 3.88 (HDOT, 2023).
[6]Route 76Between MP 1.28 and 2.11 (HDOT, 2023).
[7]Route 76 Between MP 0.92 and 1.28 (HDOT, 2023).
[8]Route 76 Between MP 0 and 0.92 (HDOT, 2023).
[9]Route 7145 Between MP 0 and 0.719 (HDOT, 2023).
[10]Route 7141 Between MP 0.28 and 1.49 (HDOT, 2023).

Legend: AADT = Annual Average Daily Traffic; HDOT = Hawaiʻi Department of Transportation; MCB = Marine Corps Base.

Figure 3.7-2 Roadways Near MCB Hawaii Kaneohe Bay

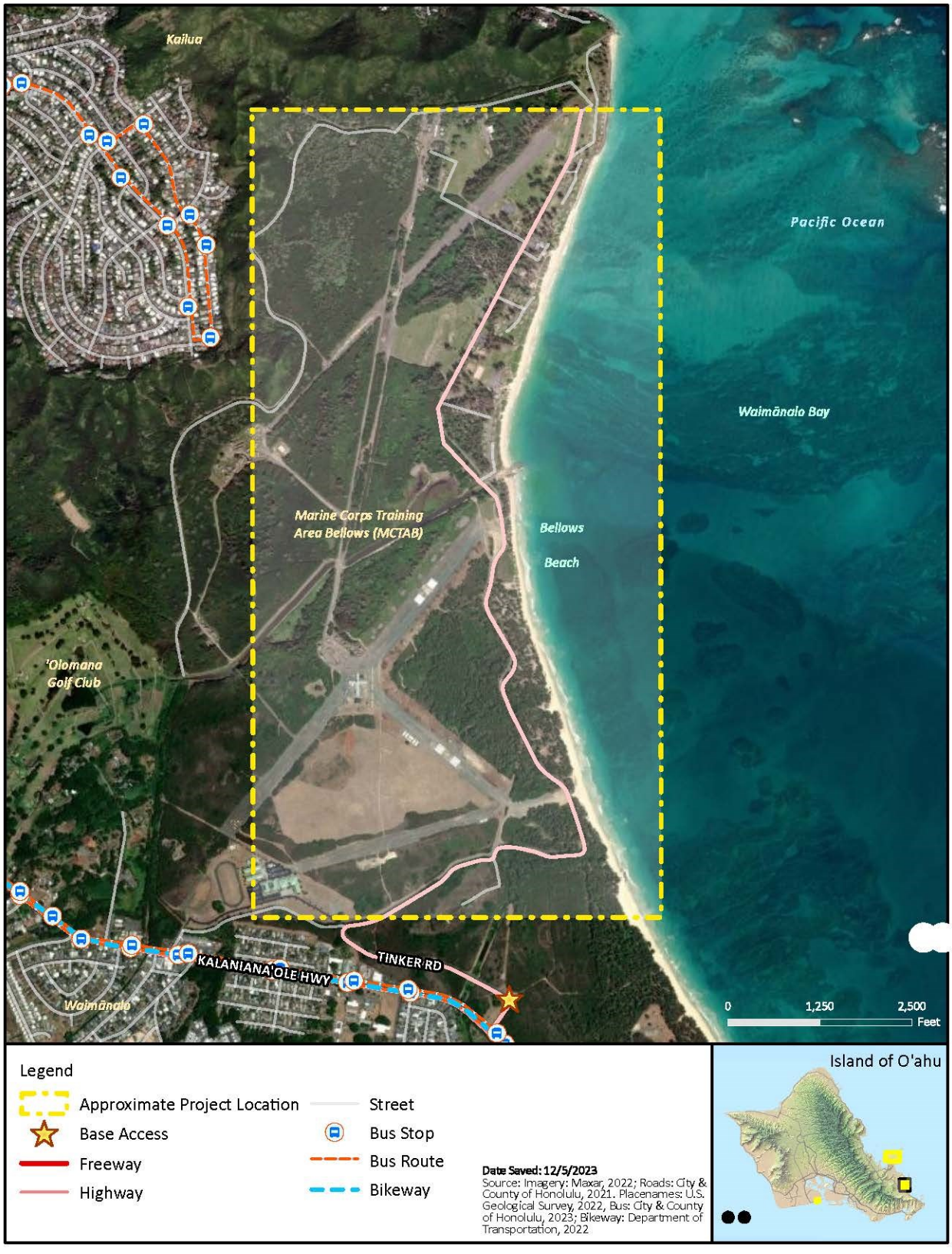


Figure 3.7-3 Roadways Near MCTAB

Figure 3.7-4 Roadways Near Pu'uloa RTF

Motor vehicle traffic into MCB Hawaii Kaneohe Bay is controlled by two security gates. The main gate is located at the north end of the H-3 highway (see Figure 3.7-2). It has two inbound and two outbound lanes, and is normally open 24 hours a day, 7 days a week. On a typical weekday, approximately 950 vehicles enter the main gate in the morning peak hour of traffic, and approximately the same number depart via the main gate in the afternoon peak hour of traffic (MCB Hawaii, 2021c). The Mōkapu gate is located on Mōkapu Road, has one inbound and one outbound lane, and is open between 5:00 a.m. and 10:00 p.m. on weekdays and between 8:00 a.m. and 2 p.m. on weekends and holidays. The roadways that provide access to MCB Hawaii Kaneohe Bay are identified in Table 3.7-1 and for those roadways where data is available, annual average daily trips are provided. Current level of service (LOS) data are not available for most roadways outside the base; however, the 2010 LOS data indicated H-3 was LOS A (i.e., free flowing traffic) for most hours of the day, with LOS B (reasonably free flowing traffic) for the peak morning and afternoon traffic hours outside the main entry gate.

There are several bus routes serving the Kailua community in the vicinity of the base; however, there are no bus stops at MCB Hawaii Kaneohe Bay. The nearest bus stop is located at Aikahi Park Shopping Center, which is about 3,000 feet from the Mōkapu gate (see Figure 3.7-2). The distance from the bus stop to the nearest MCB Hawaii Kaneohe Bay residential quarters is about 1.2 miles.

The existing bikeway network near MCB Hawaii Kaneohe Bay consists of shared use paths, bike lanes, and bike routes shared with roadways (City and County of Honolulu, 2019). Bike facilities near MCB Hawaii Kaneohe Bay include a shared use path along the east side of H-3 between Kāneʻohe Bay Drive and MCB Hawaii Kaneohe Bay main gate and a shared roadway along Kāneʻohe Bay Drive between Mōkapu Road and H-3, which connects to other facilities within the Kailua community.

3.7.1.2 MCTAB

Motor vehicle traffic into MCTAB occurs through the entrance on Tinker Road, just off Kalanianaʻole Highway. Beach access to the public is available on weekends and holidays, and the public uses this same route to access the beach. There is currently no LOS data for roads outside the training area. The roadways that provide access to MCTAB are identified in Table 3.7-1 and for those roadways where data is available, annual average daily trips are provided. Route 89 is the one bus route serving the MCTAB community along the Kalanianaʻole Highway. There are two bus stops, one for each direction, on Kalanianaʻole Highway at Tinker Road (see Figure 3.7-3). The existing bikeway network near MCTAB consists of a shoulder bikeway and shared road. Kalanianaʻole Highway is a shared roadway with a shoulder bikeway along both sides of the highway spanning from Kumuhau Street to Oluolo Street (City and County of Honolulu, 2019).

Ground-based training currently occurs approximately 620 times per year at MCTAB. This training involves convoys of vehicles, equipment, and personnel from MCB Hawaii Kaneohe Bay to MCTAB. These convoys are along existing roadways and are consistent with typical roadway traffic. MCB Hawaii Order 3060.1 establishes prescribed convoy routes to designated training areas on Oʻahu. The route to MCTAB uses H-3, Kamehameha Highway, Kalanianaʻole Highway, and Tinker Road entering MCTAB (see Figure 3.7-3). The average number of off-base trips is five per day (see Table 2-3), and MCTAB represents approximately 78% of the off-base training at Marine Corps ranges (see Table 2-1). The largest convoy consists of 10 vehicles. While most convoys are smaller, using 10 vehicles per convoy results in an average of 39 vehicles per day using local roadways to access MCTAB. This represents less than 1% of the Average Annual Daily Traffic (AADT) on Kalanianaʻole Highway (see Table 3.7-1) (AADT is

a basic measurement that indicates vehicle traffic load on a road segment. AADT estimates the mean traffic volume across all days for a year for a given location along a roadway).

3.7.1.3 Pu'uloa RTF

Motor vehicle traffic access to Pu'uloa RTF occurs via Fort Weaver Road to Iroquois Road and then to West Loch Drive and through the Iroquois Point Military Housing community. There is no LOS data for roads outside the training area. The roadways that provide access to Pu'uloa RTF are identified in Table 3.7-1 and for those roadways where data are available, annual average daily trips are provided.

The Route 44 and Route W1 bus routes serve the Pu'uloa RTF community. Route 44 crosses Fort Weaver Road multiple times and ends at the end of Fort Weaver Road where it turns into Cormorant Road (City and County of Honolulu, 2023a). The closest bus stop to Pu'uloa RTF along this bus route is located at Hanakahi Street and North Road (City and County of Honolulu, 2023b). Route W1 follows Fort Weaver Road to North Road and loops back to Fort Weaver Road (shown in Figure 3.7-4) (City and County of Honolulu, 2023a). The closest bus stop on this route to Pu'uloa RTF is at the intersection of Fort Weaver Road and 'Ewa Beach Park (City and County of Honolulu, 2023b).

The existing bikeway network near Pu'uloa RTF consists of shared use paths, bike lanes, and bike routes shared with roadways (City and County of Honolulu, 2019). Bike facilities near Pu'uloa RTF include a shared use path on the west (and north) side of Fort Weaver Road, while there is a bike lane, shoulder bikeway, and portions of a shared roadway along the east (and south) side of Fort Weaver Road. Iroquois Road from Fort Weaver Road to West Loch Road and West Loch Road to North Road is a shared use path. North Road has a dedicated bike lane (City and County of Honolulu, 2019).

Ground-based training currently occurs approximately 180 times per year at Pu'uloa RTF. This training involves convoys of vehicles, equipment, and personnel from MCB Hawaii Kaneohe Bay to Pu'uloa RTF. These convoys are along existing roadways and are consistent with typical roadway traffic. MCB Hawaii Order 3060.1 sets out specific convoy routes to designated training areas on O'ahu that all military must adhere to. The route to Pu'uloa RTF uses H-3, H-1, Fort Weaver Road (Highway 76), Iroquois Road, West Loch Drive, and Cormorant Drive (see Figure 3.7-4). The average number of off-base trips is five per day (see Table 2-3), and Pu'uloa RTF represents approximately 22% of the off-base training at Marine Corps ranges (see Table 2-1). Assuming a maximum of 10 vehicles per convoy, this represents an average of 11 vehicles per day using local roadways to access Pu'uloa RTF. This represents less than 1% of the AADT on the road segment of Fort Weaver Road (see Table 3.7-1).

3.7.2 Environmental Consequences

3.7.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur and there would be no change to transportation.

3.7.2.2 Facilities Alternatives

Preferred Facilities Locations

Under Alternative 1, construction traffic would occur on the segment of the H-3 freeway between the Mōkapu Interchange and the MCB Hawaii Kaneohe Bay main gate. Construction traffic would be required to enter and exit the installation through the main gate. The Marine Corps estimated construction traffic using a recent comparable construction project (Mōkapu Elementary School

improvements) would be approximately 68 additional vehicle trips per day entering and exiting the installation at the main gate in the morning and afternoon peak periods, representing a 7% increase over normal conditions if all traffic were to occur in the same hour. While such an increase could cause minor delays in entering the base, it is similar to fluctuations that occur with other construction projects at MCB Hawaii Kaneohe Bay and are accommodated without affecting H-3 traffic (MCB Hawaii, 2021c). The entrance to the main gate is at the end of the H-3 and approximately 0.5 mile from the last H-3 exit. Construction traffic would be considerably less than 1% of average daily traffic volume on H-3 and have no effect on H-3 traffic, which averages 13,400 trips per day. As such, only traffic entering MCB Hawaii Kaneohe Bay would be minimally affected by the proposed action and would not change the LOS of H-3 off base during peak or non-peak hours. Construction vehicles and equipment would be limited to entering the installation through the main gate, so project construction would not impact the off-base neighborhood near Mōkapu gate. An HDOT permit would be required to transport oversized equipment and overweight vehicles on state roadways, such as the H-3.

For these reasons, the preferred facilities construction component of Alternative 1 would have less than significant impacts to transportation outside MCB Hawaii Kaneohe Bay.

Alternate Facilities Locations

Under this alternative, alternate facilities locations would primarily involve reuse and renovation of existing facilities, and there would be minimal construction. As noted in other resources, the only construction that would occur would be for Projects 2 and 3, thus the alternate facility locations would result in significantly less construction activity, a much shorter construction period, and less construction vehicles using the H-3 and local roadways to access MCB Hawaii Kaneohe Bay. The general analysis presented above for construction would apply to the alternative facilities construction components. As such, considering the reduced amount of construction from the preferred construction Alternative 1, the alternative facilities construction component of Alternative 2 would have less than significant impacts to transportation.

3.7.2.3 Operational Alternatives

Alternative 1

Traffic

Training with modernized equipment would occur in the same locations and be at the same type and tempo as current ground-based training. Training with modernized equipment at MCB Hawaii Kaneohe Bay would involve movement of vehicles from support facilities on the installation to various training locations located on the installation. Under the proposed action there would be no change in the number of Marine Corps Hawaii ground forces personnel, resulting in no additional personnel vehicles added to the road network off the installation.

Training with modernized equipment at MCTAB and Pu‘uloa RTF would involve the movement of vehicles from support facilities at MCB Hawaii Kaneohe Bay to MCTAB and Pu‘uloa RTF, following the routes identified in Section 3.7.1.2. As explained in Section 2.1.3, the number and types of vehicles and trips for training using the modernized equipment would be similar to the type and tempo of military traffic currently transiting from MCB Hawaii Kaneohe Bay to MCTAB and Pu‘uloa RTF (see Table 2-3). Convoys traveling to MCTAB and Pu‘uloa RTF would adhere to MCB Hawaii Order 3060.1, which identifies specific routes for transiting and prohibits convoys from using off-base public highways during peak traffic hours. As described for the affected environment, current military traffic represents less

than 1% of the AADT on Kalaniana‘ole Highway and less than 1% of the AADT on the most lightly used road segment of Fort Weaver Road (see Table 3.7-1), and this would be the same for Alternative 1.

Bus Routes

Alternative 1 would not impact bus operations on county and state rights-of-way during the construction or training periods, because there are no bus routes to MCB Hawaii Kaneohe Bay, MCTAB, or Pu‘uloa RTF. Therefore, Alternative 1 would have no impacts to bus routes.

Bikeways

During the construction and training periods, no changes would occur to bike facilities on county and state rights-of-way. Bikeways and access to bikeways would remain unchanged. Therefore, Alternative 1 would have no impacts to bikeways.

For these reasons, Alternative 1 training would have less than significant impacts to transportation outside MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF.

Alternative 2

Traffic

Alternative 2 would have a 20% increase in the number of training events annually with the modernized equipment. This would amount to an average increase of three training events per week for MCB Hawaii Kaneohe Bay and MCTAB and an increase of once every week for Pu‘uloa RTF. This would represent an average of less than one additional vehicle convoy per day on roadways to MCTAB or Pu‘uloa RTF (see Table 2-3). Modernized equipment training under Alternative 2 would involve movement of vehicles from support facilities at MCB Hawaii Kaneohe Bay to MCTAB and Pu‘uloa RTF, following the routes identified in Sections 3.7.1.2 and 3.7.1.3, respectively. While a 20% increase in military traffic, Alternative 2 ground-based training at MCTAB would still represent less than 1% of the AADT on Kalaniana‘ole Highway, and anticipated traffic associated with the Alternative 2 level of ground-based training at Pu‘uloa RTF would still represent less than 1% of the AADT on Fort Weaver Road. Therefore, the slight increase in training would result in less than significant change to existing roadway traffic volumes.

Bus Routes

Alternative 2 would not impact bus operations on county and state rights-of-way during the construction or training periods, because there are no bus routes to MCB Hawaii Kaneohe Bay, MCTAB, or Pu‘uloa RTF. Therefore, Alternative 2 would have no impacts to bus routes.

Bikeways

During the construction and training periods, no changes would occur to bike facilities on county and state rights-of-way. Bikeways and access to bikeways would remain unchanged. Therefore, Alternative 2 would have no impacts to bikeways.

For these reasons, Alternative 2 training would have less than significant impacts to transportation outside MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF.

4 Cumulative Impacts

This section (1) defines cumulative impacts; (2) describes past, present, and reasonably foreseeable future actions in the affected area; (3) analyzes the incremental interaction the proposed action may have with other reasonably foreseeable actions; and (4) evaluates cumulative impacts potentially resulting from these interactions.

4.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts follows the objectives of NEPA, CEQ regulations, and CEQ guidance. Cumulative impacts are defined in 40 CFR 1508.1(g) as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."

In addition, CEQ and USEPA have published guidance addressing implementation of cumulative impact analyses to include *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ, 2005), and *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (USEPA, 1999). The CEQ guidance *Considering Cumulative Impacts Under NEPA* (1997) says cumulative impact analyses should "…determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative impacts of other past, present, and future actions...identify significant cumulative impacts…[and]…focus on truly meaningful impacts."

Cumulative impacts arise when a relationship exists between a proposed action and other actions expected to occur in a similar location and/or during a similar time period. To identify cumulative effects, the analysis addresses the following three fundamental questions.

- Does a relationship exist such that affected environmental components of the proposed action might interact with the affected environmental components of past, present, or reasonably foreseeable actions?
- If one or more of the affected environmental components of the proposed action and another action could be expected to interact, would the proposed action affect or be affected by impacts of the other action?
- If such a relationship exists, does an assessment reveal any potentially significant impacts not identified when the proposed action is considered alone?

4.2 Scope of Cumulative Impacts Analysis

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the timeframe in which the effects could be expected to occur. Cumulative impacts assess the impact of the proposed action when viewed in context with other past, present, and reasonably foreseeable actions. Past actions are considered part of the "baseline" analysis, unless they are incomplete or ongoing, and future actions are included where they are sufficiently certain to occur. The timeframe for cumulative impacts centers on the timing of the proposed action. Effects of past actions are reflected in current baseline conditions.

4.3 Past, Present, and Reasonably Foreseeable Actions

Actions included in the cumulative impacts analysis for MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF are shown in Table 4-1.

Table 4-1 Past, Present, and Reasonably Foreseeable Actions

Index #	*Action*	*Year*	*Description*
MCB Hawaii Kaneohe Bay			
1	Regimental Consolidated Communications/ Electrical Facility	2018–2022	• Consolidation of facilities (20,423 square feet) in over seven facilities around the base.
2	Mōkapu Gate Entry Control AT/FP Compliance	2018–2022	• Includes demolition; Building 1188 is under construction (2,800 square feet).
3	District CHW and DHW Plant for Buildings 7046, 6047, and 7057-7059	2020	• Centralize water production to eliminate redundant chiller. New facility for the chiller pad, along with water lines (900 square feet).
4	Corrosion Control Hangar	2019–2023	• Support paint stripping activities for tilt-rotor and rotary-wing aircraft (31,904 square feet).
5	Bachelor Enlisted Quarters (Aviation Support)	2020	• Demolition: Walkways 1003, 1004, and 1005; Buildings 227, 228, 3000 and cooling plant (341,001 square feet).
6	Waikulu Family Housing	2018	• Redeveloped into 375 three- and four-bedroom duplexes and multiplexes.
7	Hana Like Family Housing	2018	• Redeveloped into 182 three- and four-bedroom duplexes and multiplexes.
8	Mōkapu Elementary School Campus Improvements	2023	• Redevelopment of existing school campus for classrooms, administration, library, and cafeteria facilities, along with a covered play court, playfield, and surface parking lots (162,000 square feet).
9	Helicopter Squadrons Deactivation	2021–2022	• AH-1/UH-1 squadron (27 aircraft) and the CH-53E squadron (15 aircraft) were deactivated, and the RQ-21 squadron was divested from the VMU squadron. Resulted in a decrease of approximately 841 personnel plus family members.
10	Airfield Guard Houses	2023	• Relocate Guard Houses along Mōkapu Road.
11	Dog Kennel	2021	• Construct a new dog kennel facility.
12	Rappel Tower and Gas Chamber	2021	• Demolition: Building 6042. Reconstruct in place, total of 3,700 feet (larger than Building 6042).
13	Bachelor Enlisted Quarters	2022–2026	• 180-person quarters. Buildings 1655 and 1656 (48,470 square feet).
14	Phase 1 Electrical Distribution Modernization, Base-wide	2022–2026	• Repair and upgrade various components of the electrical distribution system, including substations, switching stations, and addition of SCADA System. Renovates primary substations 5033, 820, 5092 (13,681 square feet).
15	Bachelor Enlisted Quarters	2024–2028	• 200-person quarters. Demolition: Building 386, 1634, and 1635 (47,620 square feet).

Index #	*Action*	*Year*	*Description*
16	WWTP Redundancy and Modernization	2025–2031	• Upgrade the Base WWTP to provide redundant treatment systems to address State of Hawai'i recommendation and for contingency operations in case of failure of critical components. Demolition: Sludge Beds 977 and 978.
17	H-3 Main Gate Entry Control AT/FP Compliance	2025–2028	• Demolition: Buildings 1636 and 1637. Reconstruct in place.
18	Maintenance Facility	2029	• New consolidated maintenance facility and warehouse storage, and replacement van pads. Demolition: Van Pads C and D (53,733 square feet).
19	Phase 2 Electrical Distribution Modernization	2026–2030	• Repair and upgrade various components of the electrical distribution system and upgrade substation 1125. Demolition: Building 1274.
20	KC-130J Refuel Pit	2031	• New refuel pit for KC-130s.
21	Consolidated GCS Complex	2033	• Construct new concrete pad, upgrade electrical power, install security fencing for GCSs.
22	Bachelor Enlisted Quarters	2031	• 200-person Bachelor Enlisted Quarters to support new Aviation Squadrons and MWSS. This is the third part of original 608 Bed P-886. Demolition: Buildings 1604 and 1632.
23	Pless Hall Redevelopment	2033	• Renovate Pless Hall.
24	Home Basing of the MQ-9 Marine Unmanned Aerial Vehicle Squadron and KC-130J Marine Aerial Refueler Transport Squadron	2023–2028	• Home base a Marine Corps MQ-9 Marine Unmanned Aerial Vehicle Squadron (with an anticipated 6 aircraft) and a KC-130J Aerial Refueler Transport Squadron (with an anticipated 15 aircraft) at MCB Hawaii Kaneohe Bay. • Conduct approximately 3,000 MQ-9 and 5,280 KC-130J annual aircraft operations. • Station approximately 676 personnel plus dependents at MCB Hawaii Kaneohe Bay.
25	New Aircraft Hangar and Apron	2025	• Replace Hangar 103 and construct a new parking apron.
26	KC-130J Wash Rack	2026	• Construct a new wash rack for KC-130Js.
27	Flightline Security Fencing	2026	• Repair existing flightline fencing. • Construct new flightline fencing. • Construct two new parking structures on 1st Street.
28	Air Traffic Control Company M Compound	2028	• Facility for Air Traffic Control Company M with Company Headquarters, Operations Building, Operations Vehicle Laydown, Vehicle Maintenance Building, Van Pads, Communications Shop, and storage.
29	Alternate Communications Feeder	2030–2034	• New communications ductbank.

Index #	Action	Year	Description
30	C-40 Aircraft Maintenance Hangar and Parking Apron	2025–2027	• Construct and operate a modified Type III aircraft hangar at MCB Hawaii Kaneohe Bay with an aircraft apron and other supporting infrastructure modifications to support C-40A aircraft maintenance and operations. • Demolish existing Hangar 104 and existing site elements.
MCTAB			
1	Perimeter Security Fence	2020	• Install a perimeter fence around MCTAB.
Pu'uloa RTF			
1	Upgrade Pu'uloa Entry Control Facility	2025	Upgrade Pu'uloa Entry Control Facility at the Front Gate.
2	Upgrade Pu'uloa Entry Control Facility	2025	Upgrade Pu'uloa Entry Control Facility at the Back Gate.
3	EA (2019), Shoreline Stabilization at Pu'uloa RTF	2020	Initiate measures to mitigate coastal erosion, including: • installation of sheet pile along the fast land boundary of Ranges A and B; • a maximum-feasible retreat/setback from the shoreline of Ranges C-F; and • revegetation of available fast land areas fronting all ranges as feasible.
4	EIS (2022), Pearl Harbor Naval Shipyard Dry Dock and Waterfront Production Facility	2023–2028	• Construct and operate a graving dry dock and waterfront production facility at Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility, including permanent auxiliary facilities and utilities. • This proposed dry dock would replace existing Dry Dock 3.
5	HART Rail System	In Progress	• 20-mile elevated urban rail transit system along the south shore of O'ahu between East Kapolei and Ala Moana Center. • The first phase of the system, from East Kapolei to Aloha Stadium, is operational and open to the public as of late June 2023.
6	Wai Kai Lagoon and Surf Park	Complete	• Recreation park next to Hoakalei Country Club. Water activities in 52-acre lagoon with a 100-foot-wide wave pool.

Legend: AT/FP = Anti-terrorism Force Protection; CHW = Chilled Water; DHW = Domestic Hot Water; EA = Environmental Assessment; EIS = Environmental Impact Statement; GCS = Ground Control Station; HART = Honolulu Area Rapid Transit; MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; MWSS = Marine Wing Support Squadron; RTF = Range Training Facility; SCADA = Supervisory Control and Data Acquisition; VMU = Marine Unmanned Aerial Vehicle Squadron; WWTP = Wastewater Treatment Plant.

Source: MCB Hawaii, 2023c.

4.4 Cumulative Impact Analysis

Noise. The past, present, and future actions at MCB Hawaii Kaneohe Bay would include the use of construction equipment that would result in increased temporary intermittent noise levels within the affected environment. The timing of some future projects in Table 4-1 may overlap temporally and geographically with the construction period of the proposed action, which is scheduled to occur over an 8-year period. However, noise level increases would be temporary and typical of standard construction

activities as identified in the noise resource section. While individual construction activities would temporarily increase noise levels in the construction area, the varied scale, location, and timing of future construction, and the relatively short duration of the proposed action noise effects, would result in less than significant cumulative impacts. The projects identified in Table 4-1 would have minimal training noise impacts at MCB Hawaii Kaneohe Bay, MCTAB, and Pu'uloa RTF; none of the Table 4-1 projects involve an increase in training activities at the three training areas. As such, the proposed action would not contribute to an increased noise environment at any of the three training area locations. For these reasons, implementation of the proposed action would not result in significant construction or training cumulative noise impacts.

Air Quality. The projects listed in Table 4-1 using construction equipment would result in increased temporary air emissions of both criteria pollutants and GHGs in the affected environment similar to those described for construction in the Air Quality resource section. Future projects may overlap temporally and geographically with the construction period of the proposed action; however, the area is in attainment of the NAAQS for all criteria pollutants, and the incremental increase to air emissions identified for the proposed action would be well below threshold limits even when considered along with the projects in Table 4-1 (see Section 3.2, *Air Quality*). For these reasons, the proposed action, when added to emissions from past, present, and future actions would not be anticipated to result in significant cumulative air quality impacts within the affected environment.

GHG Emissions. On January 9, 2023, the CEQ published the interim guidance, *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*. The guidance explains how agencies should apply NEPA principles and existing best practices to their climate change analyses.

Construction emissions are estimated to occur over an 8-year period. Annual Social Costs of Greenhouse Gas estimated societal damage costs for construction emissions would range from $37,349 at 3% discount to $169,129 for the 95th percentile, representing the worst-case value. Estimates for the total Social Costs of Greenhouse Gas emissions for all 6 years of construction emissions would range from $340,996 to $1,028,067 for 3% and the 95th percentile, respectively. Implementation of the proposed action would contribute to emissions of GHGs from the combustion of fossil fuels. For Alternative 1, the estimated annual Social Costs of Greenhouse Gas societal damage costs for emissions associated with training would range from $893 in 2025 at 3% discount to $4,113 in 2050 for the 95th percentile. For Alternative 2, the estimated annual Social Costs of Greenhouse Gas emissions associated with training would range from $1,071 in 2025 at 3% discount to $4,936 in 2050 for the 95th percentile of 3%. Emissions were estimated using assumed distances to training areas and the results are presented in Table 4-2. In addition to evaluating the total net change emissions per year, the estimated 25-year net change lifecycle emissions are also identified.

Table 4-2 GHG Estimates for Operational Emissions

Activity	*CO_2e (Metric tons)*
Alternative 1	
Baseline Annual GHG total	39.5
25-year lifecycle emissions	**988**
Alt 1 Annual GHG total	15.8
25-year lifecycle emissions	**395**
Annual GHG net change	-23.7
25-year net change lifecycle emissions	**-593**
Alternative 2	
Baseline Annual GHG total	39.5
25-year lifecycle emissions	**988**
Alt 2 Annual GHG total	19.0
25-year lifecycle emissions	**474**
Annual GHG net change	-20.5
25-year net change lifecycle emissions	**-513**

Note: Values may not add up due to rounding.
Legend: CO_2e = carbon dioxide equivalent; GHG = greenhouse gas.

Water Resources. The projects listed in Table 4-1 could have effects to water resources; however, all projects at MCB Hawaii Kaneohe Bay would be constructed in accordance with NPDES permit regulations, incorporate LID features to limit the increase in stormwater runoff, and incorporate standard BMPs such as those in the Storm Water Management Plan (MCB Hawaii, 2023b). None of the projects in Table 4-1 are associated with ground-based training at MCB Hawaii Kaneohe Bay, MCTAB, or Pu'uloa RTF. Finally, the proposed action does not involve an increase in personnel and thus would not contribute to any change in water usage. For these reasons, the proposed action would not result in significant cumulative water quality impacts within the affected environment.

Cultural Resources. Past, present, and reasonably foreseeable future projects in Table 4-1 could adversely affect cultural resources within the Mōkapu House Lots Archaeological District at Pali Kilo, the NAS Kaneohe Bay Administration District, and the Waimānalo Archaeological District. All the projects with a federal nexus have been or would be reviewed under NHPA Section 106 to determine effects to historic properties or other cultural resources. Any adverse effects to historic properties have been or would be resolved through mitigation, reducing impacts such that the historic properties would remain eligible for listing in the NRHP. The proposed action does not itself result in significant impacts to cultural resources. For these reasons, the proposed action would not result in significant cumulative impacts to cultural resources within the affected environment.

Terrestrial Biological Resources. While the proposed action along with the activities in Table 4-1 contribute to the continued urban buildup of the Mōkapu Peninsula, construction-related projects would occur at previously developed and actively used areas. Construction noise would be temporary and, in many cases, would be similar to operational activities that currently occur throughout the installation. In addition, BMPs identified in Table 2-4 would be applied to future projects to further avoid or minimize potential effects to wildlife (including ESA-listed species) during the construction. BMPs to educate contractors and military personnel about natural resources and ESA-listed species would also continue to be implemented. The projects in Table 4-1 are largely upgrades to or replacement of existing infrastructure; therefore, the nature of the projects would not significantly introduce new noise sources

nor significantly increase the amount of impervious surfaces at MCB Hawaii Kaneohe Bay. Regarding a cumulative increase in barbed wire on Mōkapu Peninsula, which poses a risk of entanglement for the Hawaiian hoary bat, proposed fencing would minimize use of barbed wire fencing with the goal of achieving no net gain in barbed wire fencing (Table 2-4). None of the projects in Table 4-1 are associated with ground-based training at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF. For these reasons, the proposed action would not result in significant cumulative impacts to terrestrial biological resources in the affected area.

Public Health and Safety. Future construction activities at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF identified in Table 4-1 would consist of activities similar to the proposed action and would occur entirely within installation and training area boundaries. No public safety effects would occur with these projects as they are all located on base and at least 0.5 mile from the nearest community (Kailua). The proposed perimeter fencing at MCTAB and entry control facilities upgrades at Pu‘uloa RTF would enhance security at these locations, so this would not adversely affect public health and safety. No reasonably foreseeable actions are located near MCTAB. Some reasonably foreseeable construction projects occur outside of the Pu‘uloa RTF, but the proposed action involves only a continuation of training at this location at same type and tempo as existing training. This would have no change to public safety outside the range and would not overlap with changed traffic volumes associated with other reasonably foreseeable actions. Use of radars associated with modernized equipment would be identical to current radar use at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF. The radar systems would continue to be used within range boundaries and at minimum distances from military personnel, ordnance, and fuel to meet safety requirements. For these reasons, the proposed action would not result in significant cumulative public health and safety impacts within the affected area.

Transportation. Transportation associated with MCB Hawaii Kaneohe Bay construction projects may overlap in time with those in some of the projects in Table 4-1 and may contribute to traffic on roadways on H-3. Any increase, even from multiple projects including the perimeter fencing project at MCTAB, is not anticipated to be significant. The construction portion of the proposed action would increase average daily traffic volume on H-3 less than 1%. At any given time, no more than three construction projects would be underway, including the proposed action. Even at three times the volume, the proposed construction component would still represent a very small percentage increase above existing average daily traffic volume on H-3. As such, construction would not result in a significant cumulative impact. Regarding training activity, none of the projects in Table 4-1 are associated with ground-based training at MCB Hawaii Kaneohe Bay, MCTAB, and Pu‘uloa RTF and would not add operational traffic to public roadways. While increased traffic at ‘Ewa Beach would occur due to reasonably foreseeable actions such as the Wai Kai Lagoon and Surf Park, the existing intersections were projected to continue operating at acceptable levels during weekday morning and afternoon peak periods (Honokea Kalaeloa, LLC, 2023). In addition, the Honolulu Area Rapid Transit rail project is designed to reduce roadway traffic, which could potentially result in less traffic commuters to/from ‘Ewa Beach using the Honolulu Area Rapid Transit rail system. For these reasons, the proposed action would not result in significant cumulative impacts to transportation.

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APPENDIX A
REGULATORY SETTING

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Appendix A: Regulatory Setting

The Marine Corps has prepared this Environmental Assessment (EA) based upon federal and state laws, statutes, regulations, and policies pertinent to the implementation of the proposed action:

- American Indian Religious Freedom Act (42 United States Code [U.S.C.] 1996)
- Archeological and Historic Preservation Act (54 U.S.C. §§ 312501–312508)
- Archaeological Resources Protection Act (16 U.S.C §§ 470aa–470mm)
- Chapter 344, State Environmental Policy
- Clean Air Act (42 U.S.C. §§ 7401–7671q)
- Clean Water Act (33 U.S.C. section 1251 et seq.)
- Coastal Zone Management Act (16 U.S.C. section 1451 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. section 9601 et seq.)
- Council on Environmental Quality National Environmental Policy Act Regulations, 40 CFR §§ 1500-1508
- Endangered Species Act (16 U.S.C. section 1531 et seq.)
- Energy Independence and Security Act, United Facilities Criteria 3-210-10
- Executive Order (EO) 11988, Floodplain Management (42 Federal Register 26951)
- EO 11990, Protection of Wetlands (42 Federal Register 26961)
- EO 12088 as amended, Federal Compliance with Pollution Control Standards
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks
- EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, and the Migratory Bird Treaty Act (66 Federal Register 3853, 16 U.S.C. §§ 703–712)
- EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management (72 Federal Register 3919)
- EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis (86 Federal Register 7037)
- EO 14008, Tackling the Climate Crisis at Home and Abroad (86 Federal Register 7619)
- EO 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability (88 Federal Register 70935)
- EO 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All (88 Federal Register 25251)
- Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. section 136 et seq.)
- Hawai‘i Coastal Zone Management Program
- Hawai‘i State Plan
- Marine Corps Environmental Compliance and Protection Program (Marine Corps Order 5090.2)
- Migratory Bird Treaty Act (16 U.S.C. section 703 et seq.)
- National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-4370h
- National Environmental Policy Act (NEPA); Council on Environmental Quality (CEQ) NEPA implementing regulations; Navy procedures for implementing NEPA (42 U.S.C. § 4331; 40 CFR parts 1500–1508; 32 CFR part 775)
- National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (88 Federal Register 1196)
- National Historic Preservation Act of 1966, as amended (54 U.S.C. 100101 et seq.)

- Native American Graves Protection and Repatriation Act (25 U.S.C. §§ 3001-3013)
- Noise Control Act (42 U.S.C. §4901 et seq.)
- Oʻahu General Plan
- Policies and Responsibilities for Implementation of the National Environmental Policy Act Within the Department of the Navy (32 Code of Federal Regulations [CFR] part 775)
- Pollution Prevention Act (NPA), 42 U.S.C. §§ 13101-13109
- Protection of Historic Properties, 36 CFR Part 800
- Resource Conservation and Recovery Act (42 U.S.C. section 6901 et seq.)
- Safe Drinking Water Act (42 U.S.C. section 300f et seq.)
- State of Hawaiʻi Energy Goal
- Toxic Substances Control Act (15 U.S.C. sections 2601 et seq.)

APPENDIX B
PUBLIC COMMENTS AND RESPONSES

To Be Provided in Final EA

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APPENDIX C
NATIONAL HISTORIC PRESERVATION ACT
SECTION 106 CONSULTATION

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UNITED STATES MARINE CORPS
MARINE CORPS BASE HAWAII BOX 63002
KANEOHE BAY HAWAII 96863-3002

5090
LFE/141-23
1 Nov 2023

Dr. Alan Downer
Deputy State Historic Preservation Officer
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Dear Dr. Downer:

SUBJECT: **EXPEDITED REVIEW:** CONTINUING SECTION 106 CONSULTATION (ARCHAEOLOGY) FOR HICRIS PROJECT 2023PR01113 GROUND-BASED FORCES MODERNIZATION ABOARD MARINE CORPS BASE HAWAII, DISTRICT OF KOʻOLAUPOKO, AHUPUAʻA OF KANEOHE, ON THE ISLAND OF OʻAHU, TMK 1-4-4-008:001.

Marine Corps Base Hawaii (MCBH) is continuing consultation with your office in compliance with Section 106 of the National Historic Preservation Act (NHPA) regarding the proposed Ground-based Forces Modernization (GFM) aboard MCBH identified as HICRIS Project 2023PR01113. Based on consulting party comments received in response to the 12 September 2023 MCBH initial Section 106 letter (LFE/117-23) for this project, MCBH is expanding the project's area of potential effects (APE) to include training areas at MCBH Kaneohe Bay, Marine Corps Training Area Bellows (MCTAB), and Puuloa Range Training Facility (RTF) as well as the eight (8) projects described in our initial letter. This letter also describes our expanded efforts regarding identification of historic properties. In accordance with the NHPA Section 106 Implementing Regulations at 36 CFR 800.4, we have reviewed the existing information about subsurface archaeological resources within the APE and determined that additional steps are needed to identify potential subsurface historic properties.

PROJECT DESCRIPTION

The proposed undertaking is the modernization of equipment, infrastructure, and training for Marine Corps ground-based forces in Hawaii to enhance the combat capability of these Hawaii-based ground forces by enabling them to meet United States (U.S.) Marine Corps responsibilities set forth in Title 10 United States Code (USC) Section 8063 in support of the U.S. Indo-Pacific Command (USINDOPACOM). This proposed undertaking is subject to an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA) that addresses (1) equipment modernization, (2) facilities construction/renovation, and (3) training for Marine Corps ground-based forces in Hawaii at MCBH and associated training ranges in Hawaii. There would be no change in the number of Marine Corps ground forces personnel in Hawaii because of this proposed undertaking. Of these three components, the upgrade, renovation, and construction of support facilities at the Kaneohe Bay installation has the potential to cause effects on historic properties, assuming such historic properties are present. The first and third components, equipment modernization and training at the associated training ranges in Hawaii, has the potential to cause effects on historic properties assuming such historic properties are present. Our continuation of Section

106 consultation, therefore, has been expanded to include equipment modernization and military training at MCBH Kaneohe Bay, MCTAB, and Puuloa RTF in addition to the upgrade, renovation, and construction of support facilities included in GFM projects at the Kaneohe Bay installation.

The proposed changes in equipment are evolutions of existing equipment with operational characteristics similar to those historically used by Marine Corps ground forces in Hawaii. The modernized equipment would be stored and maintained at MCBH. Such equipment includes the Navy-Marine Expeditionary Ship Interdiction System (NMESIS), a type of joint light tactical vehicle (JLTV) consisting of a chassis with different options for modules built on top that would provide the Marine Corps with an anti-ship missile capability fired from land. For training events, this equipment and personnel would transit over base and public roadways (depending on the location of the Range and Training Area) from MCBH to the training area and then back to base. Other JLTVs are currently in use on all Hawaii military training ranges. The modernized equipment also includes the Marine Air Defense Integrated System (MADIS) and Light MADIS (L-MADIS), both of which are similar to current anti-armor weapons systems and would attach to an ultralight tactical vehicle (ULTV) similar to a commercial off-road vehicle. The MADIS and LMADIS are replacing the UTV's currently in use on Hawaii training ranges.

The NMESIS and MADIS are mounted on JLTVs, and these new systems first began production in 2016 and entered the Marine Corps inventory in 2019. The JLTV is smaller and lighter than the legacy High Mobility Multipurpose Wheeled Vehicle (HMMWV), and both vehicles are currently used on Oahu ranges. The L-MADIS system is mounted on an ULTV, which is similar to a commercial off-road utility vehicle. The L-MADIS is smaller and lighter than the Utility Task Vehicle (UTV) currently used on Oahu ranges. The L-MADIS system would operate in a similar manner to the existing anti-aircraft training previously conducted by equipment mounted on the Marines' existing UTV. While the Ground/Air Task-Oriented Radar (G/ATOR) is a new piece of equipment, it is mounted and towed on vehicles currently used in training on Oahu.

Modernized equipment would be utilized on all existing Marine Corps training areas on Oahu [enclosure 1] where existing ground-based training currently occurs. Because these systems replace and upgrade legacy equipment, the operational employment of the NMESIS, MADIS, L-MADIS and G/ATOR would be similar to the tactics employed by legacy equipment. Established vehicle paths and approved areas would be used to set up and employ the equipment within the ranges; no new or expanded training areas are proposed in this action. Units training with the NMESIS would engage in setup and employment tactics similar to those used by current cannon batteries, with the important distinction that the proposed NMESIS units would not engage in live fire. MADIS and L-MADIS systems would be employed similar to current JLTV and UTV-mounted anti-aircraft systems in maneuver, targeting and simulated firing. The G/ATOR would replace a family of radars currently in use and used daily on Oahu and would not require additional spectrum clearance. All modernized vehicles are wheeled (not tracked) and would operate on existing trails and roadways currently used for ground-based training.

The training area aboard MCBH Kaneohe Bay has a total of 15 ranges, located in the Ulupau Crater, that support individual and small unit live-fire training. Training activities include wheeled vehicle maneuver and foot

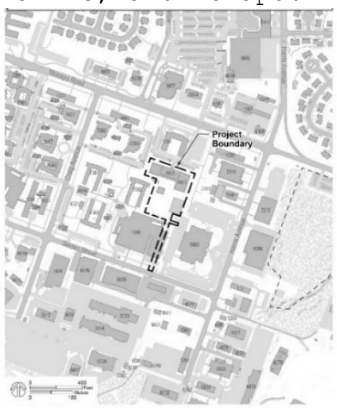
patrols that occur year-round. A concrete pad inside the Pyramid Rock Training Area (PRTA) will be re-used for G/ATOR system training activities, which would include occasional operation of the radar system for maintenance purposes. As stated in the table below, the existing concrete pad has a small non-structural wall built atop its surface, and this wall would be demolished to allow for the G/ATOR system equipment to sit flush atop the pad. The non-structural wall sits atop the concrete pad, so demolishing it will not result in any ground disturbance.

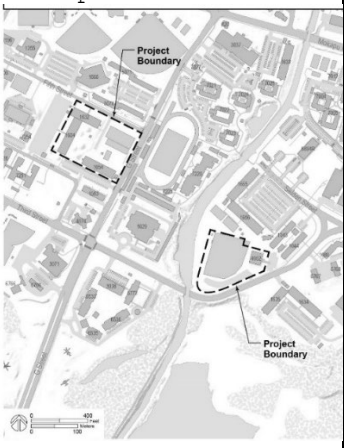
MCTAB encompasses 1,072 acres approximately 8 miles south of MCBH Kaneohe Bay and adjacent to Bellows Air Force Station (BAFS) and between the communities of Kailua and Waimanalo. MCTAB is the primary Marine Corps training area on Oahu and provides maneuvering space company and below unit level non-live-fire amphibious, helicopter, and urban training, and motorized exercises in conjunction with troop land maneuver training.

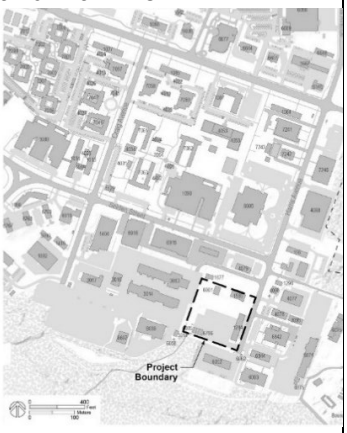
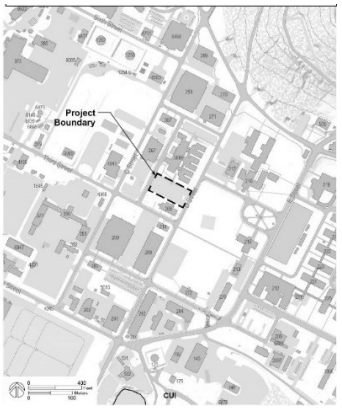
Puuloa RTF supports live-fire training for small arms training, qualification, and requalification. It is regularly used not only by the Marine Corps, but also other Department of Defense services and local law enforcement agencies.

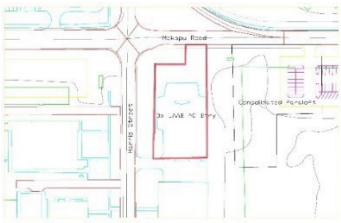
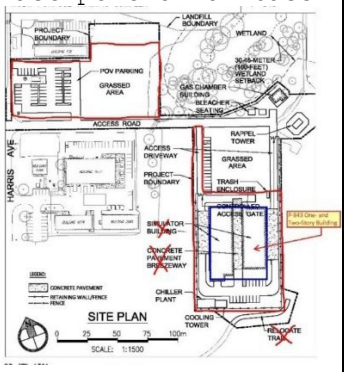
At all MCBH training ranges, the proposed new training would comply with existing avoidance area requirements and would not disturb surface soils below six inches. Existing mitigation measures are contained in the *Update to the Integrated Cultural Resources Management Plan (ICRMP), Marine Corps Base Hawaii, 2021-2026*, as well as the MCBH Order 1500.9C, Standard Operating Procedures (SOP) for Marine Corps Base Hawaii Ranges and Training Areas (Range SOP).

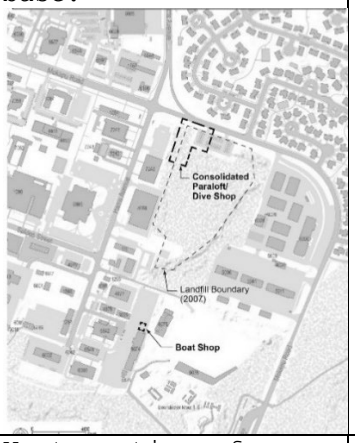
The upgrade, renovation, and construction of GFM support facilities includes new administrative, armory, and operational facilities at the Kaneohe Bay installation. Construction would occur on previously developed, paved, and landscaped areas. All areas, except the proposed replacement ballfield, would require barbed wire security fencing. Below is a table of the projects including maps and known historic properties in the project APE at the Kaneohe Bay installation.

Project	**Area of Potential Effects (APE)**	**Facilities**	**Historic Properties**
3d Marine Littoral Regiment (MLR) Armory Expansion. This project expands the existing armory to accommodate weapons stored in mobile armories. It includes construction of an access driveway and staging area. This requires demolition of basketball court 5024. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base; Selden, Craig, Harris, and Mokapu. 	4053 Armory built 1986. 5024 basketball court built 1987.	4053 is not eligible for the National Register of Historic Places (NRHP) (Wil Chee Planners et al.2014). 5024 is not 50 years old or eligible for NRHP.

Project	Area of Potential Effects (APE)	Facilities	Historic Properties
1st Low Altitude Air Defense (LAAD) Headquarters & Service (H&S) Battalion Compound. This project reuses and expands the existing armory B4052, consolidates the MACG-18 armory into the expanded B4052, and constructs a new LAAD Battalion compound. Water, sewer, and electrical utilities would be improved within the construction footprint. Location #1: Reuse and expand existing armory B4052. Includes demolition of ballfield 1528, 6523, 6689, 6690. Location #2: Construct new Ballfield. Demolish 1604, 1632, 1654, 3029 former basketball court, currently paved parking, 1616, 6661, 3006.	East portion of base 	Location #1: 4052 Armory built 1986; 1528 Softball Field built 1957; 6523 Press Booth and 6689, 6690 Baseball Dugouts built in 1990s. Location #2: 1604 BEQ built 1972; 1632 BEQ built 1974; 1654 BEQ built 1976; 1616 Medical Equip. built 1975; 3006 Weather Shelter built 1980; 3029 Basketball Court built 1981; 6661 Personnel Weather Shelter built 2003	1528, 4052, 1616 are not NRHP-eligible (Wil Chee Planners et al.2014). 6523, 6689, 6690 are not 50 years old or NRHP-eligible. 1604, 1632, 1654 fall under the Program Comment for Cold War Era Unaccompanied Personnel Housing, 1946-1974. 3006, 3029, 6661 are not 50 years old or NRHP-eligible.

Project	Area of Potential Effects (APE)	Facilities	Historic Properties
NMESIS Facility. This project constructs a three-building compound within an existing compound and expands B3013. Requires demolition of 1284, 1565, 6001, 6085 rinse pad; 6786 wash pad; and relocation of 6765C3 prefab structure. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base; corner Selden and Harris 	3013 Maintenance Building built 1980. 1284 Maintenance Shop built 1965; 1565 Shed built 1958. 6001 Vehicle wash pad built 1990; 6085 rinse pad built 1992; 6786 wash pad; 6765C3 prefab structure.	3013, 1284, 1565 are not NRHP-eligible (Wil Chee Planners et al.2014). 6001, 6085, 6786, 6765C3 are not 50 years old or NRHP-eligible.
Consolidated Communications, Information, and Intelligence Facility. This project constructs a 2-story consolidated secure facility including exterior covered area for equipment. Displaces existing private vehicle parking. Water, sewer, and electrical utilities would be improved within the construction footprint.	Central portion of base/D St. 	No buildings	

Project	Area of Potential Effects (APE)	Facilities	Historic Properties
3d Littoral Anti-Air Battalion (LAAB) Air Control Battery Compound. This project constructs Battery Headquarters, Maintenance Shop, and Vehicle Staging Area. It expands B4053 for reuse as the new Administrative Headquarters. Houses transport vehicles for G/ATOR. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base; Mokapu and Harris 	4053 Armory built in 1986. The remaining structures are either trailers, tension fabric structures, or temporary metal shelters that are all Class 3 structures and not Real Property.	4053 is not eligible for the NRHP (Wil Chee Planners et al.2014).
Live-Virtual Constructive Training Environment Complex. This project involves construction of classroom, simulators and operations trainers, and other interior support elements. May include demolition and/or renovation of 6006 and 6075. Water, sewer, and electrical utilities would be improved within the construction footprint. The blue outline shows the proposed building. The red area around it is for access/paving. The other red area near Harris Ave shows the existing temporary Class 3 structures used for training.	East portion of base 	6006 Gas Chamber built 1991 6075 Leadership Recreation Course built 1991. Remaining structures are either trailers, tension fabric structures, or temporary metal shelters that are Class 3 structures and not Real Property.	6006, 6075 are not eligible for the NRHP (Wil Chee Planners et al. 2014)

Project	Area of Potential Effects (APE)	Facilities	Historic Properties
Consolidated Paraloft/ Dive Shop Boat Shop. This project constructs a paraloft facility (drying tower and packing area for parachutes) and a boat/dive shop. The boat shop would be adjacent to Building 6874. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base. 	6874 3rd Radio Battalion Command Post built c. 2018.	6874 is not 50 years old or NRHP-eligible.
G/ATOR Climate Controlled Warehouse and Pad. This project reuses and modifies an existing concrete pad (3055X) inside the Pyramid Rock Training Area (PRTA) for periodic G/ATOR mobile equipment. At a separate location, this project demolishes Building 1180 to construct a Controlled Humidity Warehouse and Maintenance Facility for G/ATOR equipment storage. G/ATOR equipment inside the PRTA can use Portable Generator power. Modifications to Pad include removal of small non-structural walls that sit on the pad (no ground disturbance); installation of 6-8 tie downs in the pad (no ground disturbance); and resurfacing pad with an application of non-stick coating.	West portion of base. Location #1: B1180 site including adjacent parking area.  Location #2: Existing Pad in the PRTA for periodic G/ATOR use. 	1180 Ordnance Operations Building built 1959. Circular pad 3055X, pad for former Radome radar (no longer extant).	NRHP-eligible Mokapu House Lots Archaeological District at Pali Kilo, encompasses 1180, but 1180 is not a contributing historic property. B1180 was built in 1959 and is not NRHP-eligible (2014 Wil Chee Planners et al.) NRHP-listed Mokapu Burial Area (Site 1017), includes the concrete remnant of former 3055 Radome facility, but this is not a contributing historic element.

AREA OF POTENTIAL EFFECTS

The overall GFM APE includes the footprint of the eight (8) GFM projects as described and shown on the maps in the table above including the proposed location of the G/ATOR location at the PRTA, and the training ranges at MCBH Kaneohe Bay, MCTAB, and Puuloa RTF that are shown in enclosure 1.

IDENTIFICATION OF HISTORIC PROPERTIES

In accordance with the NHPA Section 106 Implementing Regulations at 36 CFR 800.4, MCBH has reviewed the existing information on the potential subsurface archaeological resources within the overall GFM APE and determined that additional steps are needed to identify subsurface historic properties at MCBH due to the absence of existing subsurface archaeological information [enclosure 2]. Accordingly, we have initiated the additional effort to identify any potential subsurface archaeological resources within the GFM APE and have enclosed the "Revised Work Plan, Subsurface Archaeological Testing, MCBH Kaneohe Bay" [enclosure 3]. The Revised Work Plan has been edited based on consulting party comments received and now includes a detailed description of mechanical trench excavations that is consistent with the methodology included in the MCBH Home Basing Memorandum of Agreement (2022), among other changes. Pursuant to 36 CFR 800.4(b), this archaeological subsurface investigation will include background research, sample field investigation, field survey, as well as consultation. The investigation will be carried out by qualified preservation professionals and in accordance with the Secretary of the Interior's Standards and Guidelines for Identification.

Known historic properties in the project APE at the MCBH Kaneohe Bay, MCTAB, and Puuloa RTF training areas are listed below.

SIHP Site No. 50-80-11-	**District/Area**	**Period[1]**	**Site Description**	**NRHP Status[2] (Significance Criterion)[3]**
MCBH Kaneohe Bay				
4626	N/A	TH	Modified outcrop	R-yes (D)
1017	N/A	TH	Mokapu Burial Area	NRHP-Listed
MCTAB				
511	Bellows Field Archaeology Area	TH	Area of habitation and burials encompassing the entire coastal area of the present Bellows AFS and MCTAB	NRHP-Listed

SIHP Site No. 50-80-11-	District/Area	Period[1]	Site Description	NRHP Status[2] (Significance Criterion)[3]
3309	Waimanalo Archaeological District (Noncontributing)	NM	Agricultural water catchment system	NRHP-Eligible (D)
3311	Waimanalo Archaeological District (Noncontributing)	NM	Irrigation ditch	NRHP-Eligible (D)
3312	Waimanalo Archaeological District (Noncontributing)	NM	Waimanalo Japanese Cemetery	NRHP-Eligible (A, D)
4850	Waimanalo Archaeological District	TH	Discontinuous subsurface cultural deposit near and may extend into MCTAB	NRHP-Eligible (D)
4851	Waimanalo Archaeological District	TH	Pre-Contact and post-Contact subsurface deposits, 15+ intact burials	NRHP-Eligible (D)
4852	N/A	TH	Subsurface deposits outside of MCTAB, includes Bellows Dune Site (O18); 3 areas of excavation	NRHP Listed
4853	Waimanalo Archaeological District	TH	Subsurface cultural deposits, possibly contains burials	NRHP-Eligible (D)
4858	Waimanalo Archaeological District	TH	Stone structures, lithic scatter, subsurface deposits, possibly burials	NRHP-Eligible (D)

SIHP Site No. 50-80-11-	District/Area	Period[1]	Site Description	NRHP Status[2] (Significance Criterion)[3]
4861	N/A	M	Concrete foundation, artifact scatter	Not evaluated
4862	N/A	M	Artifact scatter	Not evaluated
5716	N/A	TH	Cultural deposit in HIARNG RTI	R-yes (D)
5799	N/A	TH	Surface lithic scatters	Not evaluated
Puuloa RTF				
N/A	N/A	TH	Area of limestone sinkholes	Not evaluated

Notes: [1]Probable period of use: TH=traditional Hawaiian pre-Contact/19th century; NM=non-military 19th/20th century; M=military 20th century
[2]Status of nomination to the NRHP:
NRHP-listed=Listed in the NRHP
NRHP-eligible= determined eligible for NRHP with SHPD concurrence
Not eligible = determined not eligible for the NRHP with SHPD concurrence
R-yes=recommended eligible for the NRHP, SHPD concurrence not yet received
Not evaluated= no eligibility recommendation has been made to date
[3]NRHP significance criteria:
A=associated with events that have made a significant contribution to the broad patterns of our history;
D=yielded, or may be likely to yield, information important in prehistory or history

Legend: HIARNG = Hawaii Army National Guard; MCB = Marine Corps Base; MCTAB = Marine Corps Training Area Bellows; N/A = Not Applicable; NRHP = National Register of Historic Places; RTF = Range Training Facility; RTI = Regional Training Institute; SIHP = State Inventory of Historic Places

SCOPE OF IDENTIFICATION EFFORTS

The "Revised Work Plan, Subsurface Archaeological Testing, MCBH Kaneohe Bay" incorporates all consulting party comments received to date. Therefore, MCBH will proceed with the archaeological testing project as described in the "Revised Work Plan, Subsurface Archaeological Testing, MCBH Kaneohe Bay" on 8 November 2023, unless objections are received prior to that date.

After completion of the archaeological investigation, MCBH will submit the findings to your office, Native Hawaiian Organizations, and other consulting parties and consult as stipulated at 36 CFR 800.4(b) through 800.6, including evaluations of eligibility for any newly discovered subsurface archaeological deposits or sites and our proposed effect determinations. We anticipate providing this submittal in January 2024. MCBH is also forwarding a copy of this letter to the consulting parties listed below as part of the Section 106 consultation process for this undertaking, reiterating from above that we will proceed with the archaeological testing project described in the Revised Work Plan (enclosure 3) on 8 November 2023

unless any objections are received. Should you or your staff have any questions or concerns please contact the MCBH Cultural Resources Management team, Ms. June Cleghorn at 257-7126 or via email at june.cleghorn@usmc.mil, or Ms. Jessica Leger at 257-4218 or via email at jessica.leger@usmc.mil, or Dr. Wendy Wichman at 257-7134 or via email at wendy.wichman@usmc.mil.

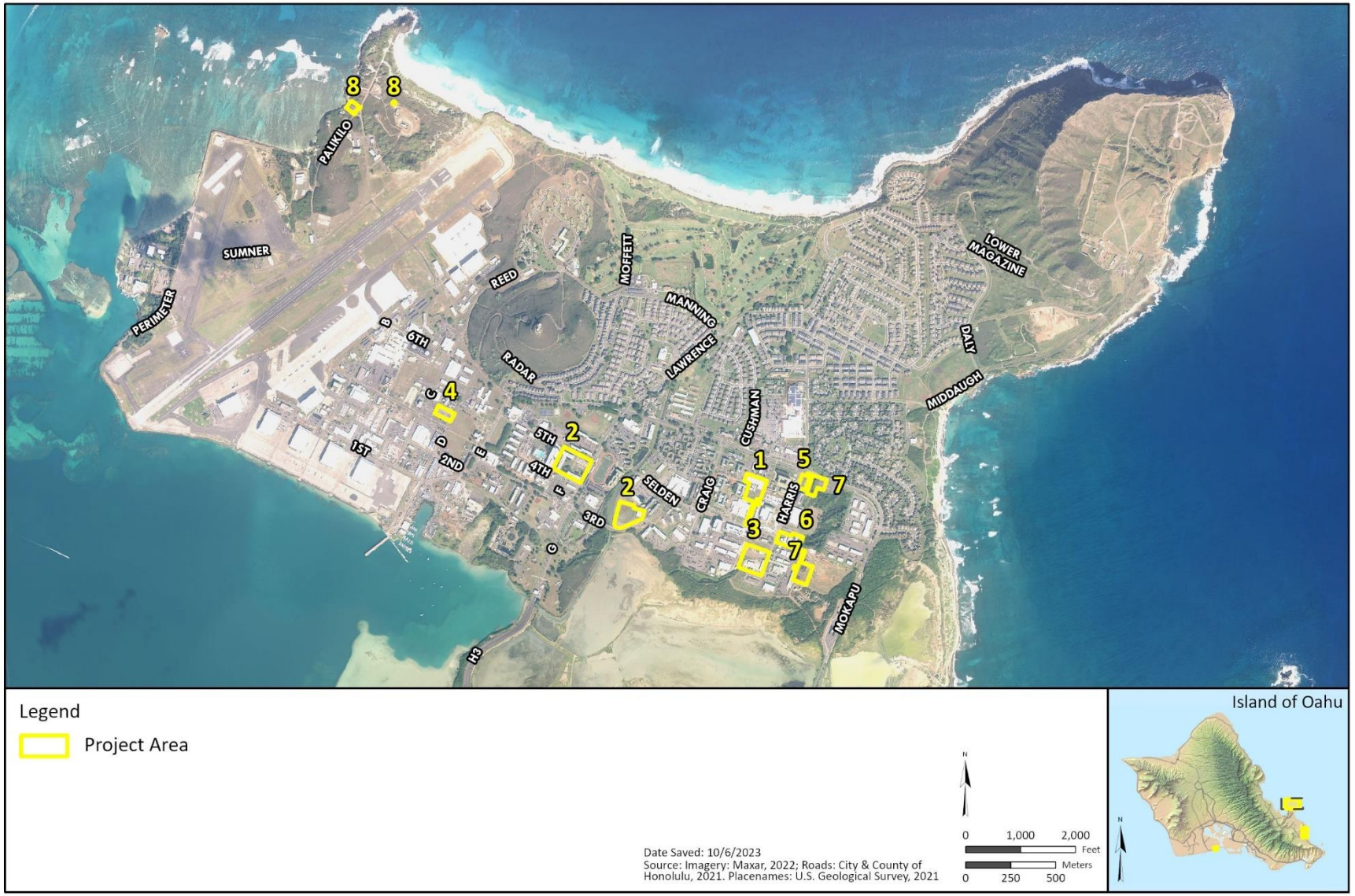
Sincerely,

J. P. Hart
Major, U.S. Marine Corps
Director, Environmental Compliance and Protection Division
By direction of the Commanding Officer

Enclosure: 1. Locations of Area of Potential Effects.
2. Revised MCBH Subsurface Survey Coverage Map.
3. "Revised Work Plan, Subsurface Archaeological Testing, Marine Corps Base Hawaii, Kaneohe Bay, Oahu, Hawaii."

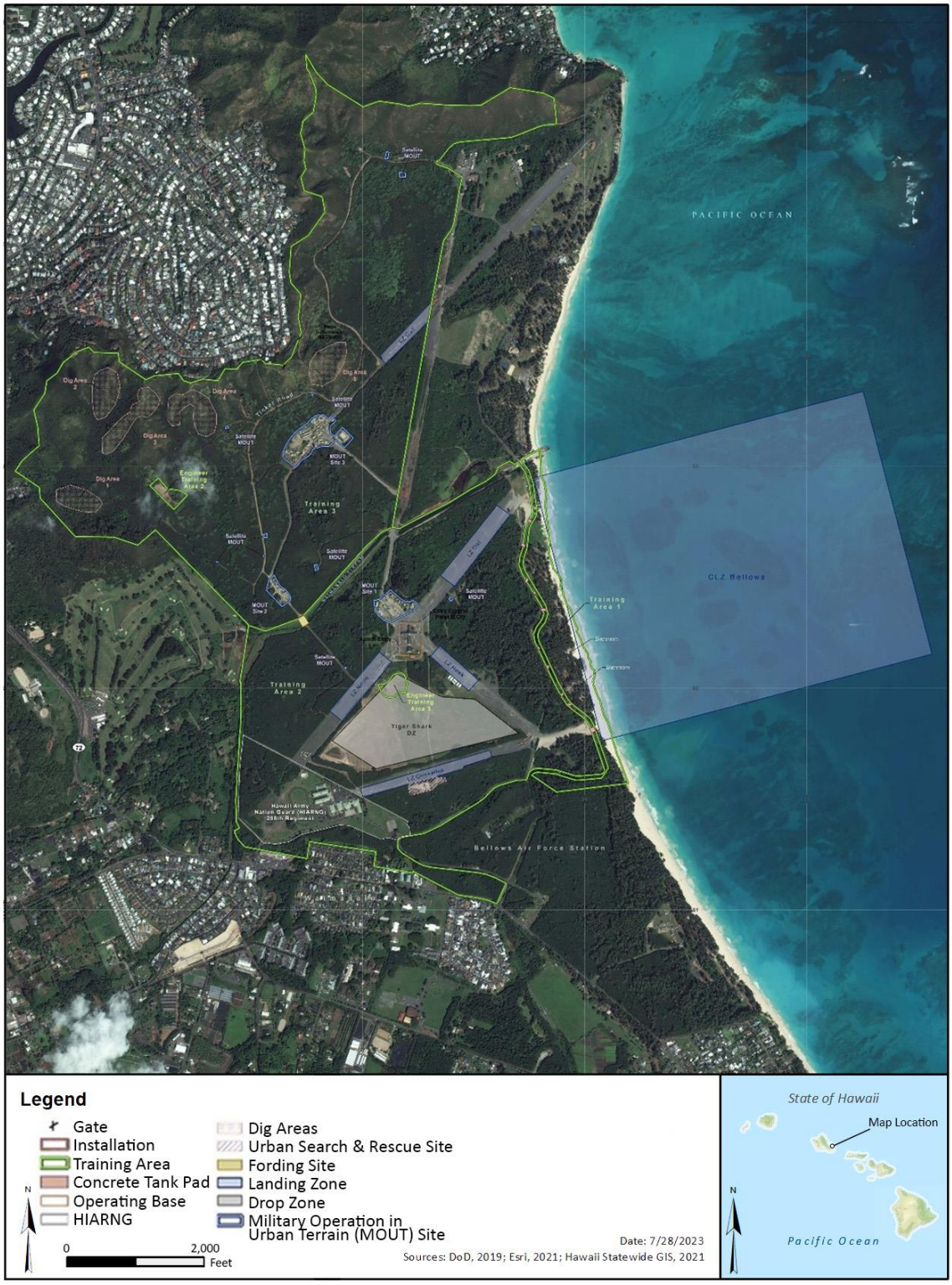
Copy to:

Ms. Anuhea Diamond, Kaulamealani Diamond; Diamond ʻOhana
Ms. Skye Razon-Olds, Kulamanu Napoleon, Kaleleonalani Napoleon; Olds ʻOhana
Ms. Emalia Keohokalole, Mr. Adrian Keohokalole, Mr. Dennis Ka`imi Keohokalole; Mr. Jerome Keohokalole; Keohokalole ʻOhana
Ms. Na`u Kamali`i; Boyd ʻOhana
Ms. Donna Ann Camvel; Paoa Kea Lono ʻOhana
Mr. Cy Harris; Kekumano ʻOhana
Ms. Terrilee Napua Kekoolani Raymond; Keko`olani ʻOhana
Ms. Malia Newhouse, Ko`olauloa Hawaiian Civic Club
Mr. Clive Cabral; Temple of Lono
Chair; Office of Hawaiian Affairs
Chair; Oahu Island Burial Council
Ms. Kiersten Faulkner, Historic Hawaii Foundation
Ms. Elizabeth Merritt, National Trust for Historic Preservation

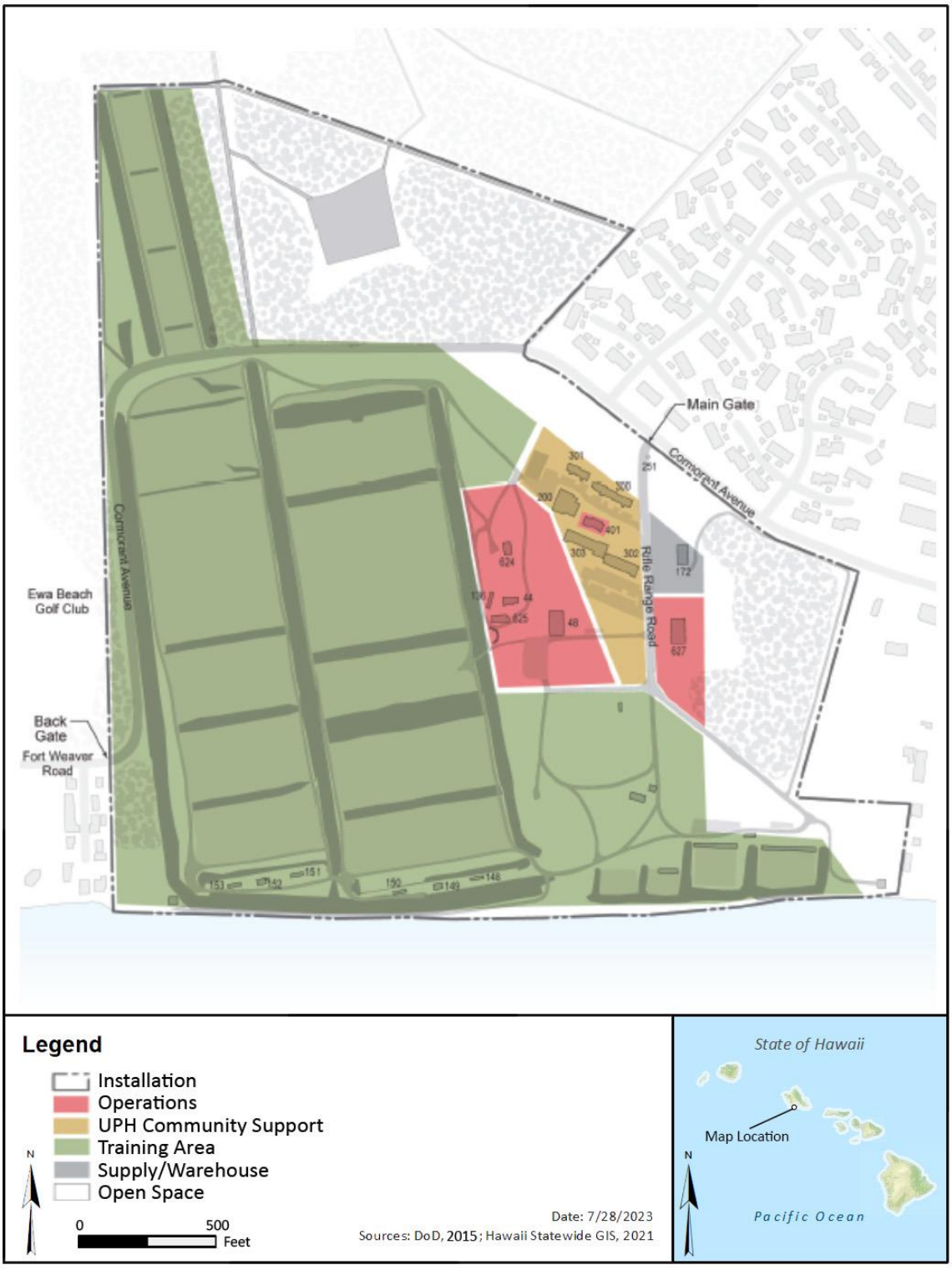


Enclosure 1a. MCB Hawaii Kaneohe Bay Footprints of the Eight GFM Projects
(Please note Project 8 is located in the Pyramid Rock Training Range)

Enclosure 1b. MCB Hawaii Kaneohe Bay Training Areas



Enclosure 1c. Marine Corps Training Area Bellows



Enclosure 1d. Puuloa Range Training Facility

Enclosure 2. Proposed Trench Locations within Project Areas Superimposed on Map of Previous Subsurface Investigations across Mōkapu Peninsula

STATE OF HAWAII | KA MOKU‘ ¯INA ‘O HAWAI‘I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ‘OIHANA KUMUWAIWAI ‘ ¯INA

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD., STE 555
KAPOLEI, HI 96707

October 10, 2023

IN REPLY REFER TO:
Project No.: 2023PR01113
Doc. No.: 2310SH01
Archaeology

Major J. P. Hart, Director
Environmental Compliance and Protection Department
United States Marine Corps
Marine Corps Base Hawai‘i Box 63002
Kaneohe Bay, Hawai‘i 96863-3002
Email: Jeffry.Hart@usmc.mil
Electronic Transmittal Only, No Hard Copy to Follow

Dear Major J. P. Hart:

SUBJECT: **National Historic Preservation Act (NHPA) Section 106 Review –
Initiation of Consultation and “Subsurface Archaeological Testing Draft Work Plan”
Ground-Based Forces Modernization Aboard Marine Corps Base Hawai‘i
Ref. No. 5090 LFE/117-23
Kaneohe Ahupua‘a, Ko‘olaupoko District, Island of O‘ahu
TMK: (1) 4-4-008:001**

The State Historic Preservation Division (SHPD) received a letter dated September 12, 2021 from the Marine Corps Base Hawai‘i (MCBH) to initiate the Section 106 historic preservation consultation process with the State Historic Preservation Officer (SHPO) for the Ground-Based Forces Modernization project at MCBH on the island of O‘ahu. The SHPD received this submittal on September 13, 2023 which includes proposed identification efforts within a Draft Work Plan for Subsurface Archaeological Testing (HICRIS Submission No. 2023PR01113.001).

The proposed project is a federal undertaking as defined in 36 CFR 800.16(y) and is therefore subject to Section 106 of the National Historic Preservation Act.

MCBH’s letter states the proposed undertaking is to modernize the existing Marine Corps ground-based forces in Hawai‘i. The project is subject to an Environmental Assessment (EA) that addresses the modernization of (1) equipment, (2) infrastructure, and (3) training for Marine Corps ground-based forces in Hawai‘i at MCBH and associated training ranges in Hawai‘i. The MCBH asserts that of these three components, only the upgrade, renovation, and construction of support facilities at the Kaneohe Bay installation has the potential to cause effects on historic properties, assuming such historic properties are present. MCBH therefore, focused the Section 106 consultation on the upgrade, renovation, and construction of support facilities by Ground-based Forces Modernization (GFM) projects at the Kaneohe Bay installation. There are eight GFM projects described as part of this undertaking.

Modernized equipment would be stored and maintained at MCBH. For training events, this equipment and personnel would transit over base and public roadways (depending on the location of the Range and Training Area) from MCBH to the training area or range and then back to base. The MCBH determined in accordance with 36 CFR 800.3(a)(1), these modernized types of equipment and training are types of activities that do not have the potential to cause effects on historic properties, assuming such historic properties are present, and in accordance with 36 CFR 800.3(a)(1) MCBH has no further obligations under Section 106 for these activities. **The SHPO does not agree** these activities meet the conditions of 36 CFR 800.3(a)(1), further **the SHPO does not agree** with the practice of

removing certain actions in a scope of work from Section 106 consultation; Section 106 consultation should include and consider all components of the undertaking. Therefore, **the SHPO recommends** the Area of Potential Effects (APE) include areas related to the activities associated with the modernized equipment and vehicle operations.

The upgrade, renovation, and construction of GFM support facilities includes new administrative, armory, and operational facilities at the Kaneohe Bay installation. Construction would occur on previously developed, paved, and landscaped areas. All areas, except the proposed replacement ballfield, would require barbed wire security fencing. A list of the proposed actions is within MCBH's letter.

The MCBH notes that the plan titled, *Draft Work Plan, Subsurface Archaeological Testing, Marine Corps Base Hawaii, Kaneohe Bay, Oahu, Hawaii*, also includes (five or six) additional areas for subsurface archaeological testing that are not part of the eight GFM construction projects. These additional testing areas were chosen during early review of future notional projects due to the absence of existing subsurface archaeological information in these areas. MCBH will initiate Section 106 consultation on these projects when the decision has been made to proceed with them. **The SHPD notes** that while the additional areas where future projects may occur may be tested, it will be determined during Section 106 consultation specific to the notional projects whether the identification efforts are adequate.

Please see attached with the HICRIS Submission 2023PR01113.001 response, the SHPD's review comments in track changes on the proposed identification efforts and the document titled, *Draft Work Plan Subsurface Archaeological Testing Marine Corps Base Hawaii, Kāneʻohe Bay, Oʻahu, Hawaiʻi* (September 2023). **The SHPO does not agree** with the proposed archaeological testing being carried out using a backhoe or mini excavator to excavate 1,040 meters of trenches. Mechanical trenching can be very destructive to archaeological deposits and can result in loss of data, especially as the plan does not stipulate screening the excavated materials unless there is a potential find nor does it stipulate precautions to mitigate destruction caused from the mechanical excavator such as scraping the surface at controlled depths at a time using a flat blade.

The SHPD opines backhoe trenching poses a threat to archaeological resources and any data that may be present and implores the MCBH to reconsider the proposed excavation method and using standard archaeological methods of hand excavation in an effort to responsibly investigate the subsurface for archaeological resources. All excavated materials should be screened through quarter inch screen.

Further, the plan should include targeted research goals to add to the current known archaeological data for Mokapu Peninsula. The SHPD suggests the identification efforts include an attempt to locate the boundaries of previously documented archaeological sites for which the extent is currently unknown. Specialized analyses should be included within the plan to answer questions about the context of previously documented sites for which modest data currently exists.

Further, the SHPO requests copies or summaries of any responses received from other consulting parties, especially Native Hawaiian organizations, regarding the proposed testing and how MCBH may have incorporated the comments into the work plan.

The SHPO does not agree with the work proposed to collect archaeological data under the *Draft Work Plan Subsurface Archaeological Testing Marine Corps Base Hawaii, Kāneʻohe Bay, Oʻahu, Hawaiʻi* (September 2023).

The SHPO looks forward to continuing Section 106 consultation for the proposed project.

Please submit all forthcoming information and correspondence related to the subject project to SHPD via HICRIS under Project No. 2023PR01113 using the Project Supplement option.

The MCBH is the office of record for this undertaking. Please maintain a copy of this letter with your environmental review record for this undertaking.

Please contact Stephanie Hacker, Historic Preservation Archaeologist IV, at Stephanie.Hacker@hawaii.gov or at (808) 692-8046 for matters regarding archaeological resources or this letter.

Aloha,

Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: June Cleghorn, MCBH (june.cleghorn@usmc.mil)
Wendy Wichman, MCBH (wendy.wichman@usmc.mil)

UNITED STATES MARINE CORPS
MARINE CORPS BASE HAWAII
BOX 63002
KANEOHE BAY HAWAII 96863-3002

5090
LFE/117-23
12 Sept 2023

Dr. Alan Downer
Deputy State Historic Preservation Officer
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Dear Dr. Downer:

SUBJECT: **EXPEDITED REVIEW:** SECTION 106 CONSULTATION(ARCHAEOLOGY)FOR GROUND-BASED FORCES MODERNIZATION ABOARD MARINE CORPS BASE HAWAII, DISTRICT OF KOʻOLAUPOKO, AHUPUAʻA OF KANEOHE, ON THE ISLAND OF OʻAHU, TMK 1-4-4-008:001.

Marine Corps Base Hawaii (MCBH) is consulting with your office in compliance with Section 106 of the National Historic Preservation Act (NHPA) regarding the proposed Ground-based Forces Modernization (GFM) aboard MCBH. This letter initiates our Section 106 consultation on the area of potential effects (APE) and efforts regarding identification of historic properties. In accordance with the NHPA Section 106 Implementing Regulations at 36 CFR 800.4, we have reviewed the existing information about subsurface archaeological resources within the APE and determined that additional steps are needed to identify potential subsurface historic properties.

EXPEDITED REVIEW

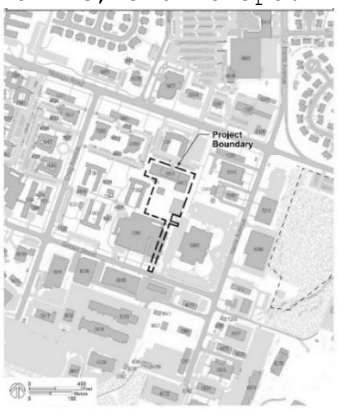
MCBH requests an expedited review period of 21 calendar days for review and comments from your office, from Native Hawaiian organizations (NHO), and from other consulting parties regarding the proposed scope of identification efforts under Section 106 Implementing Regulations at 36 CFR 800.4(a)(1-4). Upon completion of these identification efforts, MCBH will proceed with this consultation as stipulated at 36 CFR 800.4(b) through 800.6.

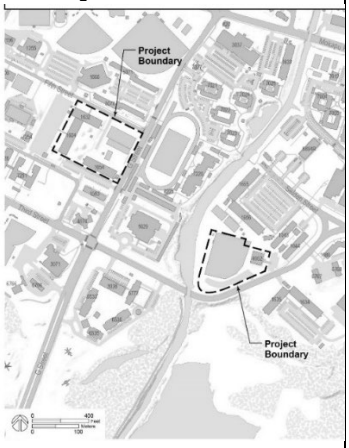
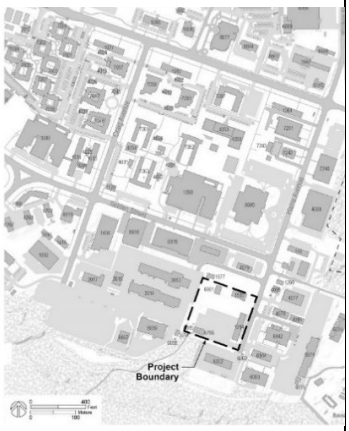
PROJECT DESCRIPTION

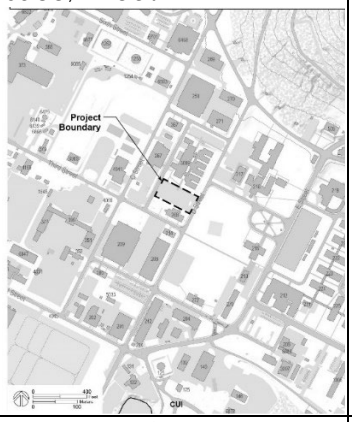
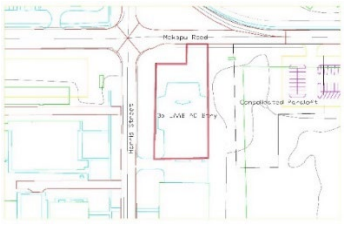
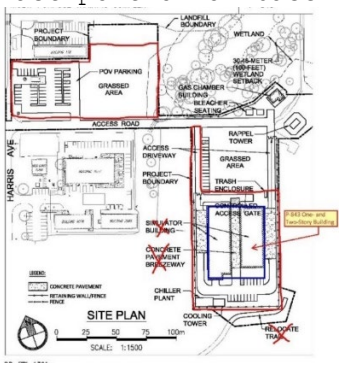
The proposed undertaking is to modernize the existing Marine Corps ground-based forces in Hawaii to enhance the combat capability of Hawaii-based Marine Corps ground forces by enabling them to meet U.S. Marine Corps responsibilities set forth in Title 10 United States Code (USC) Section 8063 in support of the U.S. Indo-Pacific Command (USINDOPACOM). It is subject to an Environmental Assessment (EA) that addresses the modernization of (1) equipment, (2) infrastructure, and (3) training for Marine Corps ground-based forces in Hawaii at MCBH and associated training ranges in Hawaii. There would be no change in the number of Marine Corps Hawaii ground forces personnel because of this proposed undertaking. Of these three components, only the upgrade, renovation, and construction of support facilities at the Kaneohe Bay installation has the potential to cause effects on historic properties, assuming such historic properties are present. Our Section 106 consultation, therefore, focuses on the upgrade, renovation, and construction of support facilities by GFM projects at the Kaneohe Bay installation.

The proposed changes in equipment are evolutions of existing equipment with operational characteristics similar to those historically used by Marine Corps ground forces in Hawaii. The modernized equipment would be stored and maintained at MCBH. Such equipment includes the Navy-Marine Expeditionary Ship Interdiction System (NMESIS), a type of joint light tactical vehicle (JLTV) consisting of a chassis with different options for modules built on top that would provide the Marine Corps with an anti-ship missile capability fired from land. For training events, this equipment and personnel would transit over base and public roadways (depending on the location of the Range and Training Area) from MCBH to the training area and then back to base. The JLTV are currently in use on all Hawaii military training ranges. The modernized equipment also includes the Marine Air Defense Integrated System (MADIS) and Light MADIS, which is similar to current anti-armor weapons systems and would attach to an ultralight tactical vehicle (ULTV) similar to a commercial Polaris off-road vehicle. Training would consist of driving the vehicle to and on the range. Thirdly, the modernized equipment includes the Ground/Air Task-Oriented Radar (G/ATOR), consisting of a radar towed on a trailer by a Medium Tactical Vehicle Replacement (MTVR) vehicle commonly used by the Marine Corps in Hawaii; a generator mounted on the MTVR; and communications equipment mounted on a High Mobility Multi-Wheeled Vehicle (HMMWV), another vehicle commonly used by the Marine Corps in Hawaii. Training would consist of vehicle maneuvers on an existing training range, with the majority of the actual G/ATOR training occurring entirely digitally. Therefore, in accordance with 36 CFR 800.3(a)(1), these modernized types of equipment and training -- NMESIS, MADIS and Light MADIS, and G/ATOR – are types of activities that do not have the potential to cause effects on historic properties, assuming such historic properties are present, and MCBH has no further obligations under Section 106 for these activities.

The upgrade, renovation, and construction of GFM support facilities includes new administrative, armory, and operational facilities at the Kaneohe Bay installation. Construction would occur on previously developed, paved, and landscaped areas. All areas, except the proposed replacement ballfield, would require barbed wire security fencing. Below is a table of the projects including maps and known historic properties in the project APE.

Project	**Area of Potential Effects (APE)**	**Facilities**	**Historic Properties**
3d Marine Littoral Regiment (MLR) Armory Expansion. This project expands the existing armory to accommodate weapons stored in mobile armories. It includes construction of an access driveway and staging area. This requires demolition of basketball court 5024. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base; Selden, Craig, Harris, and Mokapu. 	4053 Armory built 1986. 5024 basketball court built 1987.	4053 is not eligible for the National Register (NR) (Wil Chee Planners et al.2014). 5024 is not 50 years old or eligible for NR.

1st Littoral Anti-Air Detachment (LAAD) Battalion Compound. This project reuses and expands the existing armory B4052, consolidates the MACG-18 armory into the expanded B4052, and constructs a new LAAD Battalion compound. Water, sewer, and electrical utilities would be improved within the construction footprint. Location #1: Reuse and expand existing armory B4052. Includes demolition of ballfield 1528, 6523, 6689, 6690. Location #2: Construct new Ballfield. Demolish 1604, 1632, 1654, 3029 former basketball court, currently paved parking, 1616, 6661, 3006.	East portion of base 	Location #1: 4052 Armory built 1986; 1528 Softball Field built 1957; 6523 Press Booth and 6689, 6690 Baseball Dugouts built in 1990s. Location #2: 1604 BEQ built 1972; 1632 BEQ built 1974; 1654 BEQ built 1976; 1616 Medical Equip. built 1975; 3006 Weather Shelter built 1980; 3029 Basketball Court built 1981; 6661 Personnel Weather Shelter built 2003	1528, 4052, 1616 are not NR-eligible (Wil Chee Planners et al.2014). 6523, 6689, 6690 are not 50 years old or NR-eligible. 1604, 1632, 1654 fall under the Program Comment for Cold War Era Unaccompanied Personnel Housing, 1946-1974. 3006, 3029, 6661 are not 50 years old or NR-eligible.
NMESIS Facility. This project constructs a three-building compound within an existing compound and expands B3013. Requires demolition of 1284, 1565, 6001, 6085 rinse pad; 6786 wash pad; and relocation of 6765C3 prefab structure. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base; corner Selden and Harris 	3013 Maintenance Building built 1980. 1284 Maintenance Shop built 1965; 1565 Shed built 1958. 6001 Vehicle wash pad built 1990; 6085 rinse pad built 1992; 6786 wash pad;	3013, 1284, 1565 are not NR-eligible (Wil Chee Planners et al.2014). 6001, 6085, 6786, 6765C3 are not 50 years old or NR-eligible.

		6765C3 prefab structure.	
III MEF Consolidated Communications Intel-Facility. This project constructs a 2-story consolidated secure facility including exterior covered area for equipment. Displaces existing private vehicle parking. Water, sewer, and electrical utilities would be improved within the construction footprint.	Central portion of base/D St. 	No buildings	
3d Littoral Anti-Air Battalion (LAAB) Air Control Battery Compound. This project constructs Battery Headquarters, Maintenance Shop, and Vehicle Staging Area. It expands B4053 for reuse as the new Administrative Headquarters. Houses transport vehicles for G/ATOR. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base; Mokapu and Harris 	4053 Armory built in 1986. The remaining structures are either trailers, tension fabric structures, or temporary metal shelters that are all Class 3 structures and not Real Property.	4053 is not eligible for the NR (Wil Chee Planners et al.2014).
Live Virtual Constructive Training Environment. This project involves construction of classroom, simulators and operations trainers, and other interior support elements. May include demolition and/or renovation of 6006 and 6075. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base 	6006 Gas Chamber built 1991 6075 Leadership Recreation Course built 1991. Remaining structures are either trailers, tension fabric structures, or temporary	6006, 6075 are not eligible for the NR (Wil Chee Planners et al. 2014)

The blue outline shows the proposed building. The red area around it is for access/paving. The other red area near Harris Ave shows the existing temporary Class 3 structures used for training.		metal shelters that are Class 3 structures and not Real Property.	
Consolidated Paraloft and Dive Shop and 3d Radio Battalion Boat Shop. This project constructs a paraloft facility (drying tower and packing area for parachutes) and a boat/dive shop. The boat shop will be adjacent to Building 6874. Water, sewer, and electrical utilities would be improved within the construction footprint.	East portion of base. 	6874 3rd Radio Battalion Command Post built c. 2018.	6874 is not 50 years old or NR-eligible.
G/ATOR Climate Controlled Warehouse & Pad. This project reuses and modifies an existing concrete pad (3055X) inside the Pyramid Rock Training Area (PRTA) for periodic G/ATOR mobile equipment. At a separate location, this project demolishes Building 1180 to construct a Controlled Humidity Warehouse and Maintenance Facility for G/ATOR equipment storage. G/ATOR equipment inside the PRTA can use Portable Generator power. Modifications to Pad include removal of small non-structural walls that sit on the pad (no ground disturbance); installation of 6-8 tie downs in the pad (no ground disturbance);	West portion of base. Location #1: B1180 site including adjacent parking area.  Location #2: Existing Pad in the PRTA for periodic G/ATOR use. 	1180 Ordnance Operations Building built 1959. Circular pad 3055X, pad for former Radome radar (no longer extant).	NR-eligible Mokapu House Lots Archaeological District at Pali Kilo, encompasses 1180, but 1180 is not a contributing historic property. B1180 was built in 1959 and is not NR-eligible (2014 Wil Chee Planners et al.) NR-listed Mokapu Burial Area (Site 1017), includes the concrete remnant of former 3055 Radome facility, but

and resurfacing pad with an application of non-stick coating.			this is not a contributing historic element.

AREA OF POTENTIAL EFFECTS

The overall GFM Area of Potential Effects (APE) has been determined to include the footprint of the eight (8) GFM projects as described and shown on the maps in the table above.

IDENTIFICATION OF HISTORIC PROPERTIES

In accordance with the NHPA Section 106 Implementing Regulations at 36 CFR 800.4, MCBH has reviewed the existing information on the potential subsurface archaeological resources within the overall GFM APE and determined that additional steps are needed to identify subsurface historic properties in the APE due to the absence of existing subsurface archaeological information [enclosure 1]. Accordingly, we have initiated the additional effort to identify any potential subsurface archaeological resources within the GFM APE and have enclosed our "Subsurface Archaeological Testing Draft Work Plan" for your review and comment [enclosure 2]. Pursuant to 36 CFR 800.4(b), this investigation will include background research, sample field investigation, field survey, as well as consultation. The investigation will be carried out by qualified preservation professionals and in accordance with the Secretary of the Interior's (SOI) Standards and Guidelines for Identification. The archaeologists carrying out the investigation would like to begin in mid-October 2023.

Please note that the "Draft Work Plan, Subsurface Archaeological Testing, Marine Corps Base Hawaii, Kaneohe Bay, Oahu, Hawaii," also includes five (5) additional areas for subsurface archaeological testing that are not part of the eight (8) GFM construction projects. These five additional testing areas were chosen during early review of future notional projects due to the absence of existing subsurface archaeological information in these areas. MCBH will initiate Section 106 consultation on these five projects when the decision has been made to proceed with them. In the meantime, MCBH will have completed more extensive archaeological identification efforts across the Kaneohe Bay installation.

SCOPE OF IDENTIFICATION EFFORTS

As stated above, MCBH requests an expedited review period of 21 calendar days for comments regarding the scope of our proposed identification efforts in the "Draft Work Plan, Subsurface Archaeological Testing, Marine Corps Base Hawaii, Kaneohe Bay, Oahu, Hawaii," pursuant to Section 106 Implementing Regulations at 36 CFR 800.4(a)(1-4). After completion of the archaeological investigation, we will submit the findings to your office, NHOs, and other consulting parties and consult as stipulated at 36 CFR 800.4(b) through 800.6, including evaluations of eligibility for any newly discovered subsurface archaeological deposits or sites and our proposed determination of effect. We anticipate providing this submittal in January 2024. MCBH is also forwarding a copy of this letter to the consulting parties listed below as part of the Section 106 consultation process for this undertaking. Thus, MCBH requests comments from these consulting parties regarding the above

determination within 21 days of receipt of this letter. Should you or your staff have any questions or concerns please contact the MCBH Cultural Resources Management team, Ms. June Cleghorn at 257-7126 or via email at june.cleghorn@usmc.mil, or Ms. Jessica Leger at 257-4218 or via email at jessica.leger@usmc.mil, or Dr. Wendy Wichman at 257-7134 or via email at wendy.wichman@usmc.mil.

Sincerely,

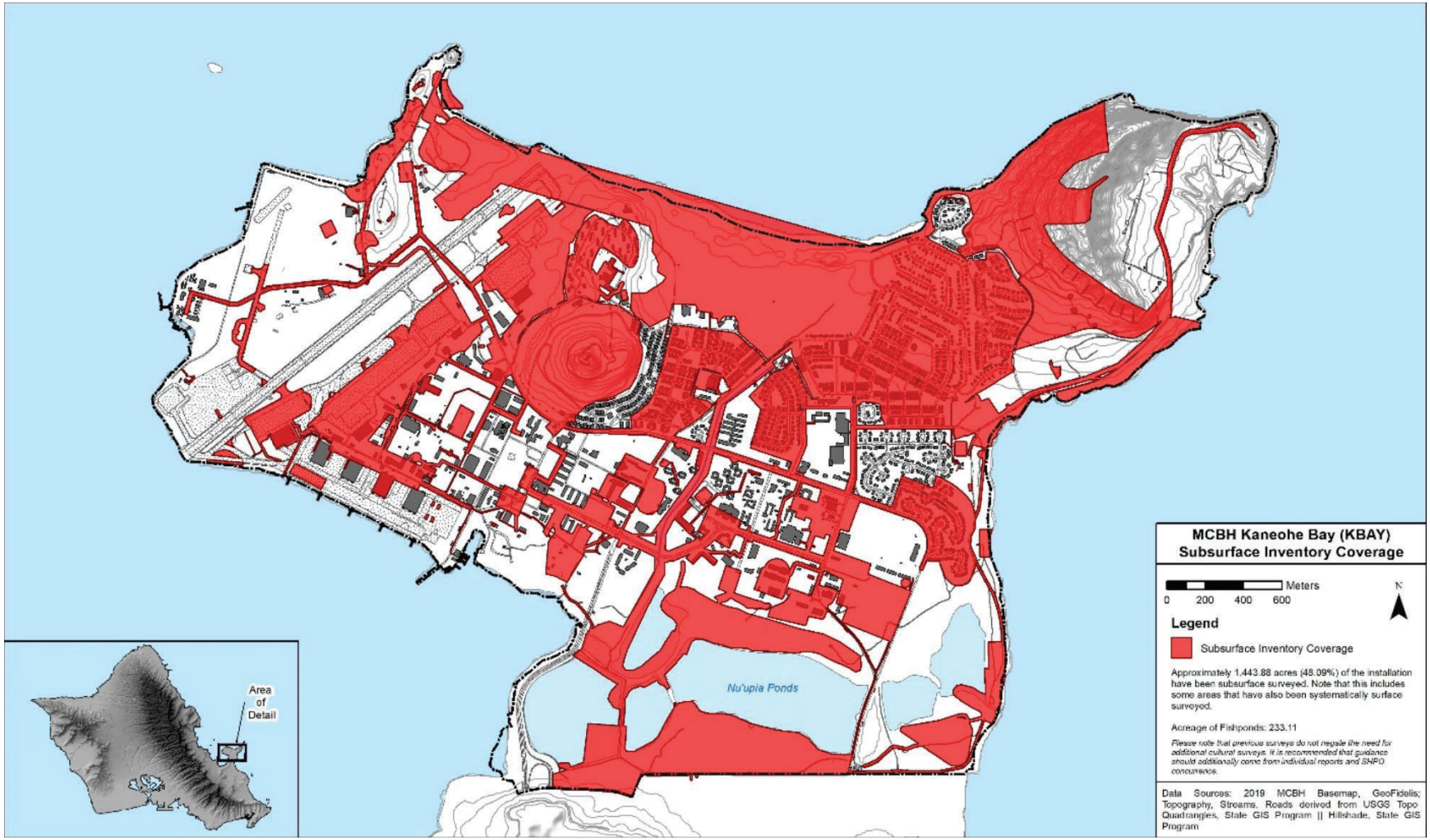
HART.JEFFRY.P.1242350568 Digitally signed by HART.JEFFRY.P.1242350568 Date: 2023.09.13 08:12:49 -10'00'

J. P. Hart
Major, U.S. Marine Corps
Director, Environmental Compliance and Protection Division
By direction of the Commanding Officer

Enclosure: 1. MCBH Subsurface Survey Coverage Map.
2. "Draft Work Plan, Subsurface Archaeological Testing, Marine Corps Base Hawaii, Kaneohe Bay, Oahu, Hawaii."

Copy to:

Ms. Anuhea Diamond, Kaulamealani Diamond; Diamond ʻOhana
Ms. Skye Razon-Olds, Kulamanu Napoleon, Kaleleonalani Napoleon; Olds ʻOhana
Ms. Emalia Keohokalole, Mr. Adrian Keohokalole, Mr. Dennis Ka`imi Keohokalole; Mr. Jerome Keohokalole; Keohokalole ʻOhana
Ms. Na`u Kamali`i; Boyd ʻOhana
Ms. Donna Ann Camvel; Paoa Kea Lono ʻOhana
Mr. Cy Harris; Kekumano ʻOhana
Ms. Terrilee Napua Kekoolani Raymond; Keko`olani ʻOhana
Ms. Malia Newhouse, Ko`olauloa Hawaiian Civic Club
Mr. Clive Cabral; Temple of Lono
Chair; Office of Hawaiian Affairs
Chair; Oahu Island Burial Council
Ms. Kiersten Faulkner, Historic Hawaii Foundation
Ms. Elizabeth Merritt, National Trust for Historic Preservation



Enclosure 1. MCBH Subsurface Survey Coverage Map

APPENDIX D
ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

To Be Provided in Final EA

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APPENDIX E
COASTAL ZONE MANAGEMENT ACT COORDINATION

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Peer Amble

From: Mendes, Debra L <debra.l.mendes@hawaii.gov>
Sent: Thursday, November 30, 2023 4:17 PM
To: Santos CIV Thomas E
Cc: Bomar CIV Jacquelyn C; Hart Maj Jeffry P; Nihipali, Justine W; Peer Amble; Bigay, John C CIV USN (USA); McWhirter Maj Travis E; Crawford LtCol Christiana R; Glover CTR Rachel K
Subject: RE: Notification of Proposed Marine Corps Ground Forces Modernization at Marine Corps Base (MCB) Hawaii, Navy/Marine Corps De Minimis Activities under CZMA

Aloha Mr. Santos,

Thank you for the additional information. This acknowledges receipt of the notification by the U.S. Marine Corps of the CZMA De Minimis List for the subject Proposed Marine Corps Ground Forces Modernization at Marine Corps Base Hawaii, Kaneohe Bay. This Hawaii CZM Program acknowledgment of receipt does not represent an endorsement of the proposed activity.

Thank you.
Debra

~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~
Debra L. Mendes
Hawaii Coastal Zone Management Program
PO Box 2359
Honolulu, HI 96804-2359
Ph: 808.587.2840
Email: Debra.L.Mendes@hawaii.gov
~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~

> **From:** Santos CIV Thomas E <thomas.e.santos.civ@usmc.mil>
> **Sent:** Thursday, November 30, 2023 10:04 AM
> **To:** Mendes, Debra L <debra.l.mendes@hawaii.gov>
> **Cc:** Bomar CIV Jacquelyn C <jacquelyn.bomar@usmc.mil>; Hart Maj Jeffry P <jeffry.hart@usmc.mil>; Nihipali, Justine W <justine.w.nihipali@hawaii.gov>; Peer Amble <Peer.Amble@cardno-gs.com>; Bigay, John C CIV USN (USA) <john.c.bigay.civ@us.navy.mil>; McWhirter Maj Travis E <travis.mcwhirter@usmc.mil>; Crawford LtCol Christiana R <christiana.crawford@usmc.mil>; Glover CTR Rachel K <rachel.glover.ctr@usmc.mil>
> **Subject:** [EXTERNAL] RE: Notification of Proposed Marine Corps Ground Forces Modernization at Marine Corps Base (MCB) Hawaii, Navy/Marine Corps De Minimis Activities under CZMA
>
> Good Morning Ms. Mendes,
>
> There will not be any changes/alterations to the training dates/times as the type of training and associated activities would be consistent with historic Marine Corps range utilization in Hawaii.
>
> V/R
>
> *Thomas Santos*
> NEPA Program Manager

Environmental Compliance and Protection Division
Marine Corps Base Hawaii
Kaneohe Bay, HI
DSN: 315-496-7139
Commercial: 1-808-496-7139
Cell: 808-272-5549
E-mail: Thomas.e.santos.civ@usmc.mil

From: Mendes, Debra L <debra.l.mendes@hawaii.gov>
Sent: Wednesday, November 29, 2023 2:26 PM
To: Santos CIV Thomas E <thomas.e.santos.civ@usmc.mil>
Cc: Bomar CIV Jacquelyn C <jacquelyn.bomar@usmc.mil>; Hart Maj Jeffry P <jeffry.hart@usmc.mil>; Nihipali, Justine W <justine.w.nihipali@hawaii.gov>; Peer Amble <Peer.Amble@cardno-gs.com>; Bigay, John C CIV USN (USA) <john.c.bigay.civ@us.navy.mil>; McWhirter Maj Travis E <travis.mcwhirter@usmc.mil>; Crawford LtCol Christiana R <christiana.crawford@usmc.mil>; Glover CTR Rachel K <rachel.glover.ctr@usmc.mil>
Subject: [Non-DoD Source] RE: Notification of Proposed Marine Corps Ground Forces Modernization at Marine Corps Base (MCB) Hawaii, Navy/Marine Corps De Minimis Activities under CZMA

Aloha Mr. Santos,
Will there be any changes/alterations to training dates/times (i.e. additional days or hours)?
Thank you.

~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ *
Debra L. Mendes
Hawaii Coastal Zone Management Program
PO Box 2359
Honolulu, HI 96804-2359
Ph: 808.587.2840
Email: Debra.L.Mendes@hawaii.gov
~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ * ~ *

From: Santos CIV Thomas E <thomas.e.santos.civ@usmc.mil>
Sent: Wednesday, November 29, 2023 11:17 AM
To: Mendes, Debra L <debra.l.mendes@hawaii.gov>
Cc: Bomar CIV Jacquelyn C <jacquelyn.bomar@usmc.mil>; Hart Maj Jeffry P <jeffry.hart@usmc.mil>; Peer Amble <Peer.Amble@cardno-gs.com>; Bigay, John C CIV USN (USA) <john.c.bigay.civ@us.navy.mil>; McWhirter Maj Travis E <travis.mcwhirter@usmc.mil>; Crawford LtCol Christiana R <christiana.crawford@usmc.mil>; Glover CTR Rachel K <rachel.glover.ctr@usmc.mil>
Subject: [EXTERNAL] Notification of Proposed Marine Corps Ground Forces Modernization at Marine Corps Base (MCB) Hawaii, Navy/Marine Corps De Minimis Activities under CZMA

Aloha Ms. Mendes,

The U. S. Marine Corps is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act of 1969 (NEPA), as implemented by the Council on Environmental Quality regulations, Department of the Navy Regulations, and Marine Corps Order 5090.2 for implementing NEPA. The proposed action is the modernization of equipment, infrastructure, and training for Marine Corps ground forces in Hawaii.

The purpose of the proposed action is to modernize existing Marine Corps ground forces in Hawaii. The need for the proposed action is to enhance the combat capability of Hawaii-based Marine Corps ground forces, enabling them to meet U.S. Marine Corps responsibilities set forth in Title 10 United States Code (USC) Section 8063 in support of the U.S. Indo-Pacific Command (USINDOPACOM).

The proposed action would occur at MCB Hawaii and associated training ranges in Hawaii. The proposed action has three components: (1) modernize equipment; (2) upgrade, renovate, and construct support facilities; and (3) conduct training activities with the modernized equipment. There would be no change in the number of Marine Corps Hawaii ground forces personnel because of the proposed action.

The proposed action falls within the Navy/Marine Corps De Minimis Activities Under CZMA, Item 1: New Construction, Item 2: Utility Line Activities, Item 10: Studies and Data Collection and Survey Activities, Item 11: Demolition, and Item 12: Military Testing and Training.

> Item 1. Construction of new facilities and structures wholly within Navy/Marine Corps controlled areas (including land and water) that is similar to present use and, when completed, the use or operation of which complies with existing regulatory requirements.
>
> Item 2. Acquisition, installation, operation, construction, maintenance, or repair of utility or communication systems that use rights of way, easements, distribution systems, or facilities on Navy/Marine Corps controlled property. This also includes the associated excavation, backfill, or bedding for the utility lines, provided there is no change in preconstruction contours.
>
> Item 10. Studies, data and information-gathering, and surveys that involve no permanent physical change to the environment. Includes topographic surveys, wetlands mapping, surveys for evaluating environmental damage, engineering efforts to support environmental analyses, core sampling, soil survey sampling, and historic resources surveys.
>
> Item 11. Demolition and disposal involving buildings or structures when done in accordance with applicable regulations and within Navy/Marine Corps controlled properties.
>
> Item 12. Routine testing and evaluation of military equipment on or over military [land or water areas], or an established range, restricted area or operating area or training conducted on or over military land or water areas in which the impact is not significant.

The relevant project mitigation/general conditions under the De Minimis agreement for New Construction, Utility Line Activities, Repair and Maintenance, Studies and Data Collection and Survey Activities, Demolition, and Military Testing and Training actions are: 1, 2, 3, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16:

> 1. Navy/Marine Corps controlled property refers to land areas, rights of way, easements, roads, safety zones, danger zones, ocean and naval defensive sea areas under active Navy/Marine Corps control.
>
> 2. If any listed species enters the area during conduct of construction activities, all activities should cease until the animal(s) voluntarily depart the area.
>
> 3. Turbidity and siltation from project related work will be minimized and contained to within the vicinity of the site through appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions.

6. No project-related materials (fill, revetment, rock, pipe, etc.) will be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands, etc.).

8. No contamination (trash or debris disposal, alien species introductions, etc.) of adjacent marine/aquatic environments (reef flats, channels, open ocean, stream channels, wetlands, etc.) shall result from project-related activities.

9. Fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored on-site, if appropriate, to facilitate clean-up of accidental petroleum releases.

10. Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.

11. Any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric, etc.) after exposure and stabilized as soon as practicable (with vegetation matting, hydroseeding, etc.).

12. Section 106, of the National Historic Preservation Act (NHPA), consultation requirements must be met. Also, follow guidelines in the area-specific Integrated Cultural Resources Management Plan (ICRMP) if applicable.

13. Project-related activities will not affect federally listed endangered/threatened plan species.

14. The National Environmental Policy Act (NEPA) review process will be completed.

15. The training, testing and evaluation will be conducted in accordance with applicable standard operating procedures protective of the environment.

16. Navy or Marine Corps staff shall notify State CZM of de minimis list usage for projects which require an Environmental Assessment (EA).

The attached document highlights proposed facilities and locations that this EA will cover.

If you have any questions or would like more information, you can reach me by e-mail at Thomas.e.santos.civ@usmc.mil or by phone at (808) 496-7139.

Thank you.

V/R

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APPENDIX F
AIR EMISSIONS CALCULATIONS

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TAB A. **CONSTRUCTION EMISSIONS Alternative 1**

Production rates from MDOT:
https://mdotwiki.state.mi.us/images_construction/a/a4/MDOT_Production_Rates.pdf

Basic Conversions

453.59	grams per pound (lbs)
43,560	Conversion from acre to square feet (SF)
0.03704	Cubic feet to cubic yards (CY)
0.1111	SF to square yards (SY)
2000	lbs per ton
145	lbs/cubic feet (ft^3) density of Hot Mix Asphalt (HMA)
12	CY haul truck capacity
9	CY concrete truck capacity
1	ft excavation depth
0.5	ft (6 in) gravel
0.5	ft (6 in) concrete/asphalt

Table 1.1 **Demolition** 176,391 SF 59 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Dozer	470	145	0.58	0.38	1.41	4.17	0.12	0.30	0.29	536
Loader/Backhoe	470	87	0.21	1.43	7.35	6.35	0.15	1.06	1.03	692
Small Backhoe	470	55	0.21	1.43	7.35	6.35	0.15	1.06	1.03	692

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dozer	32.85	123.35	363.98	10.05	25.81	25.04	46,719
Loader w/integral Backhoe	27.13	139.25	120.29	2.82	20.14	19.54	13,104
Small backhoe	17.15	88.03	76.04	1.78	12.73	12.35	8,284
Subtotal in lbs	77	351	560	15	59	57	68,107
Demo Total in Tons	**0.04**	**0.18**	**0.28**	**0.01**	**0.03**	**0.03**	
Demo Total in Metric Tons							**31**

2,156 Truck trips

Table 1.2 **Demolition - Hauling** 10 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	21,559	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dump Truck (12 CY)	32.80	173.38	777.63	0.39	32.43	31.43	74,131
Subtotal in lb:	33	173	778	0	32	31	74,131
Demo Hauling Grand Total in Tons	**0.02**	**0.09**	**0.39**	**0.00**	**0.02**	**0.02**	
Demo Hauling Total in Metric Tons							**34**

Table 1.3 **Site Prep**

Site Prep - Excavate/Fill (CY) 13,602 CY 9 days 1,134 truck trips
Grading (SY) 40,803 SY 20 days

Off-road Equipment	Hours	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Excavator	73	243	0.59	0.34	1.21	4.03	0.12	0.22	0.22	536
Skid Steer Loader	163	160	0.23	0.38	1.47	4.34	0.12	0.31	0.30	536
Dozer (Rubber Tired)	163	145	0.59	0.38	1.41	4.17	0.12	0.30	0.29	536
Compactor	163	103	0.58	0.40	1.57	4.57	0.12	0.32	0.31	536
Grader	163	285	0.58	0.34	1.21	4.07	0.12	0.23	0.22	536

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Excavator	7.89	27.73	92.40	2.64	5.11	4.96	12,286
Skid Steer Loader	5.07	19.46	57.45	1.53	4.04	3.92	7,093
Dozer (Rubber Tired)	11.59	43.54	128.47	3.55	9.11	8.84	16,490
Compactor	8.49	33.76	98.15	2.48	6.86	6.65	11,514
Grader	20.45	71.84	242.08	6.86	13.42	13.01	31,868

Excavation - Hauling 20 miles RT

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Dump Truck	22,671	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dump Truck	34.49	182.32	817.73	0.41	34.11	33.05	77,953

	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2
Subtotal in lb:	88	379	1,436	17	73	70	157,204
Site Prep Grand Total in Tons	**0.04**	**0.19**	**0.72**	**0.01**	**0.04**	**0.04**	
Site Prep Grand Total in Metric Tons							**71**

Table 1.4 **Gravel Work** 6,801 CY 68 days 567 truck trips

Off-road Equipment	Hours	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM_{10} g/hp-hr	$PM_{2.5}$ g/hp-hr	CO_2 g/hp-hr
Dozer	544	185	0.59	0.34	1.21	4.08	0.12	0.23	0.22	536
Wheel Loader for Spreading	544	87	0.59	0.35	1.25	4.23	0.12	0.24	0.23	536
Compactor	544	103	0.43	0.36	1.34	4.45	0.12	0.26	0.25	536

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dozer	45.01	158.07	534.21	15.09	29.60	28.71	70,150
Wheel Loader for Spreading	21.47	76.86	260.65	7.10	14.70	14.26	32,988
Compactor	19.10	71.12	236.50	6.12	13.66	13.25	28,462

20 miles RT

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Dump Truck	11,335	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dump Truck	17.24	91.16	408.86	0.20	17.05	16.52	38,977
Subtotal (lbs):	**103**	**397**	**1,440**	**29**	**75**	**73**	**170,577**
Gravel Work Grand Total in Tons	**0.05**	**0.20**	**0.72**	**0.01**	**0.04**	**0.04**	
Gravel Work Grand Total in Metric Tons							**77**

Table 1.5 **Concrete Work** 6,801 CY 68 days 756 truck trips

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
				Emission Factors						
Concrete Mixer	544	3.5	0.43	0.69	3.04	6.17	0.13	0.54	0.52	588
Concrete Truck	544	300	0.43	0.38	1.75	6.18	0.11	0.27	0.26	530

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
	Annual Emissions						
Concrete Mixer	1.24	5.50	11.14	0.23	0.98	0.95	1,062.02
Concrete Truck	58.73	270.14	956.66	17.64	41.58	40.33	81,994.97
Subtotal (lbs):	**60**	**276**	**968**	**18**	**43**	**41**	**83,057**
Concrete Work Grand Total in Tons	**0.03**	**0.14**	**0.48**	**0.01**	**0.02**	**0.02**	
Concrete Work Grand Total in Metric Tons							**38**

20 miles RT

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Concrete Truck	15,114	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Concrete Truck	22.99	121.54	545.15	0.27	22.74	22.03	51,969
Subtotal (lbs):	**23**	**122**	**545**	**0**	**23**	**22**	**51,969**
Concrete Truck Travel Grand Total in Tons	**0.01**	**0.06**	**0.27**	**0.00**	**0.01**	**0.01**	
Concrete Truck Travel Grand Total in Metric Tons							**24**

Table 1.6 **Construction Year 1** 181,199 SF 230 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
				Emission Factors						
Crane	1,840	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	1,840	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	1,840	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	920	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	920	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	1,840	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	920	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
	Annual Emissions						
Crane	190.77	946.85	4,083.80	88.57	161.28	156.44	411,734
Concrete Truck	98.17	761.15	2,260.99	60.37	109.93	106.63	280,622
Diesel Generator	18.32	98.30	244.78	7.53	16.18	15.69	37,412
Telehandler	60.37	466.74	583.94	15.15	61.74	59.89	70,444
Scissors Lift	50.61	391.31	489.57	12.70	51.76	50.21	59,059
Skid Steer Loader	271.38	1,277.65	1,074.04	23.83	190.69	184.96	110,784
All Terrain Forklift	51.22	396.02	495.46	12.86	52.38	50.81	59,771
Subtotal (lbs):	**741**	**4,338**	**9,233**	**221**	**644**	**625**	**1,029,827**
Year 1: Building Construction Grand Total in Tons	**0.37**	**2.17**	**4.62**	**0.11**	**0.32**	**0.31**	
Year 1: Building Construction Grand Total in Metric Tons							**467**

Construction Year 2 53,161 SF 200 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
				Emission Factors						
Crane	1,600	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	1,600	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	1,600	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	800	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	800	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	1,600	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	800	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
	Annual Emissions						
Crane	165.88	823.35	3,551.13	77.02	140.24	136.04	358,030
Concrete Truck	85.37	661.87	1,966.08	52.49	95.59	92.72	244,019
Diesel Generator	15.93	85.48	212.85	6.55	14.07	13.65	32,532
Telehandler	52.49	405.86	507.77	13.18	53.68	52.07	61,256
Scissors Lift	44.01	340.27	425.71	11.05	45.01	43.66	51,356
Skid Steer Loader	235.98	1,111.00	933.95	20.72	165.81	160.84	96,334
All Terrain Forklift	44.54	344.37	430.84	11.18	45.55	44.18	51,975
Subtotal (lbs):	**644**	**3,772**	**8,028**	**192**	**560**	**543**	**895,502**
Year 2: Building Construction Grand Total in Tons	**0.32**	**1.89**	**4.01**	**0.10**	**0.28**	**0.27**	
Year 2: Building Construction Grand Total in Metric Tons							**406**

Construction Year 3 18,070 SF 100 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
				Emission Factors						
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
	Annual Emissions						
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**

Year 3: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 3: Building Construction Grand Total in Metric Tons							**203**

Construction Year 4 20,285 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 4: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 4: Building Construction Grand Total in Metric Tons							**203**

Construction Year 5 34,974 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 5: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 5: Building Construction Grand Total in Metric Tons							**203**

Construction Year 6 16,088 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 6: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 6: Building Construction Grand Total in Metric Tons							**203**

Construction Year 7 36,606 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 7: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	

Year 7: Building Construction Grand Total in Metric Tons										203

Construction Year 8 6,878 SF 100 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
				Emission Factors						
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
	Annual Emissions						
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 8: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 8: Building Construction Grand Total in Metric Tons							**203**

Table 1.7 **Paving** 19,246 ft3 1395 tons 5 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Grader	40	145	0.59	0.38	1.41	4.16	0.12	0.30	0.29	536
Roller	40	401	0.59	0.34	2.46	5.53	0.12	0.34	0.33	536
Paving Machine	40	164	0.59	0.38	1.44	4.25	0.12	0.30	0.29	536
Asphalt Curbing Machine	40	130	0.59	0.40	1.57	4.57	0.12	0.32	0.31	536

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Grader	2.84	10.65	31.39	0.87	2.23	2.16	4,041
Roller	7.12	51.38	115.48	2.40	7.07	6.85	11,179
Paving Machine	3.24	12.31	36.28	0.98	2.56	2.48	4,571
Asphalt Curbing Machine	2.67	10.62	30.88	0.78	2.16	2.09	3,623

On-road Equipment	Hours of Operation	Engine HP	Productivity based Speed	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck	40	230	17	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
Water Truck	40	230	10	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dump Truck	1.03	5.47	24.53	0.01	1.02	0.99	2,338.21
Water Truck	0.61	3.22	14.43	0.01	0.60	0.58	1,375.42

Hot Mix Asphalt (HMA)	Volume of HMA (ft^3)	Weight of HMA (tons)	VOC lb/ton	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Standard Hot Mix Asphalt	19,246	1,395	0.04	55.81	-	-	-	-	-	-
Subtotal (lbs):				73	94	253	5	16	15	27,128
Year 1 only: Paving Grand Total in Tons				**0.04**	**0.05**	**0.13**	**0.00**	**0.01**	**0.01**	
Year 1 only: Paving Grand Total in Metric Tons										**12**

260 work days per year (5/day work week)
76 trips per day (max workers per day, all years)

Table 1.9 **Construction - Worker Trips (Annual)** 15 miles RT (based on estimated distance from center of MCBH to Kaneohe per Google maps)

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	296,804	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Light-duty Truck	451.54	2386.89	10705.75	5.36	446.53	432.67	1,020,574
Subtotal (lbs):	452	2,387	10,706	5	447	433	1,020,574
Construction Worker Trips Grand Total in Tons	**0.23**	**1.19**	**5.35**	**0.00**	**0.22**	**0.22**	
Construction Worker Trips Grand Total in Metric Tons							**463**

4 trips per day

Table 1.10 **Material Deliveries (Annual)** 1,040 trips per year 15 miles RT (based on estimated distance from center of MCBH to Kaneohe per Google maps)

On-road Equipment	Miles	Engine HP	Speed (mph)	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Delivery Truck	15,600	265	-	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Delivery Truck	23.73	125.45	562.69	0.28	23.47	22.74	53,641.24
Material Deliveries Grand Total in Tons	**0.01**	**0.06**	**0.28**	**0.00**	**0.01**	**0.01**	
Material Deliveries Grand Total in Metric Tons							**24**

Table 1.11 **Fugitive Dust Emissions**

Year	PM_{10} tons/acre/mo	acres	days of disturbance	PM_{10} Total	PM2.5/PM_{10} Ratio	$PM_{2.5}$ Total
ALL	0.42	7	29	4.5	0.1	0.4

Table 1.12 **Total Emissions**

Year	VOC Tons	CO Tons	NOx Tons	SO2 Tons	PM10 Tons	PM2.5 Tons	CO_2 Metric Tons
Year 1	0.73	3.82	11.62	0.13	2.84	0.83	1,086
Year 2	0.59	3.28	10.09	0.10	1.19	0.59	936
Year 3	0.41	2.26	7.82	0.05	0.61	0.40	707
Year 4	0.41	2.24	7.79	0.05	0.63	0.40	704
Year 5	0.42	2.28	7.92	0.05	0.68	0.42	717
Year 6	0.41	2.27	7.84	0.05	0.58	0.39	710

Year 7	0.42	2.29	7.94	0.05	0.84	0.42	719
Year 8	0.40	2.22	7.71	0.05	0.46	0.38	697

TAB B. **CONSTRUCTION EMISSIONS Alternative 2**

Basic Conversions

453.59 grams per pound (lbs)
43,560 Conversion from acre to square feet (SF)
0.03704 Cubic feet to cubic yards (CY)
0.1111 SF to square yards (SY)
2000 lbs per ton
145 lbs/cubic feet (ft^3) density of Hot Mix Asphalt (HMA)
12 CY haul truck capacity
9 CY concrete truck capacity
1 ft excavation depth
0.5 ft (6 in) gravel
0.5 ft (6 in) concrete/asphalt

Production rates from MDOT:
https://mdotwiki.state.mi.us/images_construction/a/a4/MDOT_Production_Rates.pdf

Table 1.1 **Demolition** 117,494 SF 39 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Dozer	313	145	0.58	0.38	1.41	4.17	0.12	0.30	0.29	536
Loader/Backhoe	313	87	0.21	1.43	7.35	6.35	0.15	1.06	1.03	692
Small Backhoe	313	55	0.21	1.43	7.35	6.35	0.15	1.06	1.03	692

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dozer	21.88	82.16	242.45	6.69	17.19	16.68	31,119
Loader w/integral Backhoe	18.07	92.75	80.12	1.88	13.42	13.01	8,729
Small backhoe	11.42	58.64	50.65	1.19	8.48	8.23	5,518
Subtotal in lbs	51	234	373	10	39	38	45,366
Demo Total in Tons	**0.03**	**0.12**	**0.19**	**0.00**	**0.02**	**0.02**	
Demo Total in Metric Tons							**21**

Table 1.2 **Demolition - Hauling** 1,436 Truck trips; 10 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	14,360	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dump Truck (12 CY)	21.85	115.49	517.98	0.26	21.60	20.93	49,379
Subtotal in lb:	22	115	518	0	22	21	49,379
Demo Hauling Grand Total in Tons	**0.01**	**0.06**	**0.26**	**0.00**	**0.01**	**0.01**	
Demo Hauling Total in Metric Tons							**22**

Table 1.3 **Site Prep**

Site Prep - Excavate/Fill (CY) 1,979 CY 1 days 165 truck trips
Grading (SY) 5,936 SY 3 days

Off-road Equipment	Hours	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Excavator	11	243	0.59	0.34	1.21	4.03	0.12	0.22	0.22	536
Skid Steer Loader	24	160	0.23	0.38	1.47	4.34	0.12	0.31	0.30	536
Dozer (Rubber Tired)	24	145	0.59	0.38	1.41	4.17	0.12	0.30	0.29	536
Compactor	24	103	0.58	0.40	1.57	4.57	0.12	0.32	0.31	536
Grader	24	285	0.58	0.34	1.21	4.07	0.12	0.23	0.22	536

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Excavator	1.15	4.03	13.44	0.38	0.74	0.72	1,787
Skid Steer Loader	0.74	2.83	8.36	0.22	0.59	0.57	1,032
Dozer (Rubber Tired)	1.69	6.33	18.69	0.52	1.33	1.29	2,399
Compactor	1.24	4.91	14.28	0.36	1.00	0.97	1,675
Grader	2.97	10.45	35.22	1.00	1.95	1.89	4,636

Excavation - Hauling 20 miles RT

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Dump Truck	3,298	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dump Truck	5.02	26.52	118.96	0.06	4.96	4.81	11,340

	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2
Subtotal in lb:	13	55	209	3	11	10	22,869
Site Prep Grand Total in Tons	**0.01**	**0.03**	**0.10**	**0.00**	**0.01**	**0.01**	
Site Prep Grand Total in Metric Tons							**10**

Table 1.4 **Gravel Work** 989 CY 10 days 82 truck trips

Off-road Equipment	Hours	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM_{10} g/hp-hr	$PM_{2.5}$ g/hp-hr	CO_2 g/hp-hr
Dozer	79	185	0.59	0.34	1.21	4.08	0.12	0.23	0.22	536
Wheel Loader for Spreading	79	87	0.59	0.35	1.25	4.23	0.12	0.24	0.23	536
Compactor	79	103	0.43	0.36	1.34	4.45	0.12	0.26	0.25	536

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dozer	6.55	23.00	77.71	2.20	4.31	4.18	10,205
Wheel Loader for Spreading	3.12	11.18	37.92	1.03	2.14	2.07	4,799
Compactor	2.78	10.35	34.40	0.89	1.99	1.93	4,140

20 miles RT

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Dump Truck	1,649	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2

	lb	lb	lb	lb	lb	lb	lb
Dump Truck	2.51	13.26	59.48	0.03	2.48	2.40	5,670
Subtotal (lbs):	**15**	**58**	**210**	**4**	**11**	**11**	**24,814**
Gravel Work Grand Total in Tons	**0.01**	**0.03**	**0.10**	**0.00**	**0.01**	**0.01**	
Gravel Work Grand Total in Metric Tons							**11**

Table 1.5 **Concrete Work** 989 CY 10 days 110 truck trips

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Concrete Mixer	79	3.5	0.43	0.69	3.04	6.17	0.13	0.54	0.52	588
Concrete Truck	79	300	0.43	0.38	1.75	6.18	0.11	0.27	0.26	530

	Annual Emissions						
	VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Concrete Mixer	0.18	0.80	1.62	0.03	0.14	0.14	154.49
Concrete Truck	8.54	39.30	139.17	2.57	6.05	5.87	11,927.89
Subtotal (lbs):	**9**	**40**	**141**	**3**	**6**	**6**	**12,082**
Concrete Work Grand Total in Tons	**0.00**	**0.02**	**0.07**	**0.00**	**0.00**	**0.00**	
Concrete Work Grand Total in Metric Tons							**5**

20 miles RT

On-road Equipment	**Miles**	**Engine HP**	**VOC** lb/mile	**CO** lb/mile	**NOx** lb/mile	**SO_2** lb/mile	**PM_{10}** lb/mile	**$PM_{2.5}$** lb/mile	**CO_2** lb/mile
Concrete Truck	2,199	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Concrete Truck	3.34	17.68	79.30	0.04	3.31	3.21	7,560
Subtotal (lbs):	**3**	**18**	**79**	**0**	**3**	**3**	**7,560**
Concrete Truck Travel Grand Total in Tons	**0.00**	**0.01**	**0.04**	**0.00**	**0.00**	**0.00**	
Concrete Truck Travel Grand Total in Metric Tons							**3**

Table 1.6 **Construction Year 1** 26,359 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 1: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 1: Building Construction Grand Total in Metric Tons							**203**

Construction Year 2 7,733 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 2: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 2: Building Construction Grand Total in Metric Tons							**203**

Construction Year 3 2,629 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 3: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 3: Building Construction Grand Total in Metric Tons							**203**

Construction Year 4 2,951 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 4: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 4: Building Construction Grand Total in Metric Tons							**203**

Construction Year 5 5,088 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 5: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 5: Building Construction Grand Total in Metric Tons							**203**

Construction Year 6 2,340 SF 100 days

				Emission Factors						
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 6: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 6: Building Construction Grand Total in Metric Tons							**203**

Construction Year 7 5,325 SF 100 days

				Emission Factors						
	Hours of			**VOC**	**CO**	**NOx**	**SO_2**	**PM10**	**PM2.5**	**CO_2**

Off-road Equipment	Operation	Engine HP	Load Factor	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 7: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 7: Building Construction Grand Total in Metric Tons							**203**

Construction Year 8 1,001 SF 100 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Emission Factors: VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Crane	800	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Concrete Truck	800	300	0.43	0.19	1.45	4.32	0.12	0.21	0.20	536
Diesel Generator	800	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	400	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	400	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	800	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
All Terrain Forklift	400	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595

	Annual Emissions						
	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Crane	82.94	411.67	1,775.56	38.51	70.12	68.02	179,015
Concrete Truck	42.68	330.94	983.04	26.25	47.79	46.36	122,010
Diesel Generator	7.96	42.74	106.42	3.27	7.03	6.82	16,266
Telehandler	26.25	202.93	253.89	6.59	26.84	26.04	30,628
Scissors Lift	22.00	170.13	212.85	5.52	22.50	21.83	25,678
Skid Steer Loader	117.99	555.50	466.97	10.36	82.91	80.42	48,167
All Terrain Forklift	22.27	172.18	215.42	5.59	22.78	22.09	25,987
Subtotal (lbs):	**322**	**1,886**	**4,014**	**96**	**280**	**272**	**447,751**
Year 8: Building Construction Grand Total in Tons	**0.16**	**0.94**	**2.01**	**0.05**	**0.14**	**0.14**	
Year 8: Building Construction Grand Total in Metric Tons							**203**

Table 1.7 **Paving** 0 ft3 0 tons 0 days

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Grader	0	145	0.59	0.38	1.41	4.16	0.12	0.30	0.29	536
Roller	0	401	0.59	0.34	2.46	5.53	0.12	0.34	0.33	536
Paving Machine	0	164	0.59	0.38	1.44	4.25	0.12	0.30	0.29	536
Asphalt Curbing Machine	0	130	0.59	0.40	1.57	4.57	0.12	0.32	0.31	536

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Grader	0.00	0.00	0.00	0.00	0.00	0.00	0
Roller	0.00	0.00	0.00	0.00	0.00	0.00	0
Paving Machine	0.00	0.00	0.00	0.00	0.00	0.00	0
Asphalt Curbing Machine	0.00	0.00	0.00	0.00	0.00	0.00	0

On-road Equipment	Hours of Operation	Engine HP	Productivity based Speed	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck	0	230	17	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
Water Truck	0	230	10	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Dump Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hot Mix Asphalt (HMA)	Volume of HMA (ft^3)	Weight of HMA (tons)	VOC lb/ton	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Standard Hot Mix Asphalt	0	0	0.04	0.00	-	-	-	-	-	-
Subtotal (lbs):				0	0	0	0	0	0	0
Year 1 only: Paving Grand Total in Tons				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
Year 1 only: Paving Grand Total in Metric Tons										**0**

260 work days per year (5/day work week)
11 trips per day (max workers per day, all years)
15 miles RT

Table 1.9 **Construction - Worker Trips (Annual)**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	43,176	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Light-duty Truck	65.69	347.22	1557.38	0.78	64.96	62.94	148,464
Subtotal (lbs):	66	347	1,557	1	65	63	148,464
Construction Worker Trips Grand Total in Tons	**0.03**	**0.17**	**0.78**	**0.00**	**0.03**	**0.03**	
Construction Worker Trips Grand Total in Metric Tons							**67**

4 trips per day

Table 1.10 **Material Deliveries (Annual)** 1,040 trips per year 15 miles RT

On-road Equipment	Miles	Engine HP	Speed (mph)	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Delivery Truck	15,600	265	-	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Delivery Truck	23.73	125.45	562.69	0.28	23.47	22.74	53,641.24
			Material Deliveries Grand Total in Tons	**0.01**	**0.06**	**0.28**	**0.00**	**0.01**	**0.01**	
			Material Deliveries Grand Total in Metric Tons							**24**

Table 1.11 **Fugitive Dust Emissions**

Year	PM_{10} tons/acre/mo	acres	days of disturbance	PM_{10} Total	PM2.5/ PM_{10} Ratio	$PM_{2.5}$ Total
ALL	0.42	7	4	0.7	0.1	0.1

Table 1.12 **Total Emissions**

Year	VOC Tons	CO Tons	NOx Tons	SO2 Tons	PM10 Tons	PM2.5 Tons	CO_2 Metric Tons
Year 1	0.22	1.26	3.33	0.05	0.52	0.23	320
Year 2	0.22	1.23	3.20	0.05	0.29	0.20	307
Year 3	0.21	1.20	3.13	0.05	0.22	0.19	301
Year 4	0.21	1.19	3.10	0.05	0.22	0.18	298
Year 5	0.21	1.21	3.14	0.05	0.11	0.19	302
Year 6	0.21	1.21	3.15	0.05	0.22	0.19	303
Year 7	0.21	1.21	3.15	0.05	0.25	0.19	303
Year 8	0.21	1.19	3.09	0.05	0.20	0.18	297

TAB C. Operational Emissions

NMESIS

Baseline

On-road Equipment	Miles	VOC g/VMT	CO g/VMT	NOx g/VMT	SO_2 g/VMT	PM_{10} g/VMT	$PM_{2.5}$ g/VMT	CO_2 g/VMT	CH4 g/VMT	N2O g/VMT	CO2e g/VMT
SUSH Truck	7,303	0.31	1.7382	3.1896	0.0033	1.3723	0.3327	972.7910	0.0146	0.0024	973.846
		VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM10 lb**	**PM2.5 lb**	**CO_2 lb**			
	Light-duty Truck	4.94	27.99	51.36	0.05	22.10	5.36	15663.15	0.23	0.04	15680.14
	Subtotal (lbs):	5	28	51	0	22	5	15,663	0	0	15,680
Travel to training areas - Annual Grand Total in Tons		**0.00**	**0.01**	**0.03**	**0.00**	**0.01**	**0.00**				
Travel to training areas - Annual Grand Total in Metric Tons								**7**	**0**	**0**	**7**

Alternative 1

On-road Equipment	Miles	Duration (kw-hr/hp-hr)	VOC g/VMT	CO g/kW-hr	NOx g/kW-hr	SO_2 g/VMT	PM_{10} g/hp-hr	$PM_{2.5}$ g/hp-hr	CO_2 g/kW-hr	CH4 g/VMT	N2O g/VMT	CO2e g/VMT
JLTV	18,258	11,592	0.31	2.00	6.30	0.0033	0.0707	0.0707	679.6800	0.0146	0.0024	-
			VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM10 lb**	**PM2.5 lb**	**CO_2 lb**			
		JLTV	12.34	51.11	161.00	0.13	1.81	1.81	17369.98	0.59	0.10	17403.91
		Subtotal (lbs):	12	51	161	0	2	2	17,370	1	0	17,404
Travel to training areas - Annual Grand Total in Tons			**0.01**	**0.03**	**0.08**	**0.00**	**0.00**	**0.00**				
Travel to training areas - Annual Grand Total in Metric Tons									**8**	**0**	**0**	**8**

Alternative 2

On-road Equipment	Miles	Duration (kw-hr/hp-hr)	VOC g/VMT	CO g/kW-hr	NOx g/kW-hr	SO_2 g/VMT	PM_{10} g/hp-hr	$PM_{2.5}$ g/hp-hr	CO_2 g/kW-hr	CH4 g/VMT	N2O g/VMT	CO2e g/VMT
JLTV	21,910	13,910	0.31	2.0000	6.3000	0.0033	0.0707	0.0707	679.6800	0.0146	0.0024	-
			VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM10 lb**	**PM2.5 lb**	**CO_2 lb**			
		JLTV	14.81	61.33	193.20	0.16	2.17	2.17	20843.98	0.70	0.11	20896.10
		Subtotal (lbs):	15	61	193	0	2	2	20,844	1	0	20,896
Travel to training areas - Annual Grand Total in Tons			**0.01**	**0.03**	**0.10**	**0.00**	**0.00**	**0.00**				
Travel to training areas - Annual Grand Total in Metric Tons									**9**	**0**	**0**	**9**

MADIS and L-MADIS, G/ATOR

Baseline

On-road Equipment	Miles	VOC g/VMT	CO g/VMT	NOx g/VMT	SO_2 g/VMT	PM_{10} g/VMT	$PM_{2.5}$ g/VMT	CO_2 g/VMT	CH4 g/VMT	N2O g/VMT	CO2e g/VMT
SUSH Truck/HMMWV	33,271	0.31	1.7382	3.1896	0.0033	1.3723	0.3327	972.7910	0.0146	0.0024	973.846
		VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM10 lb**	**PM2.5 lb**	**CO_2 lb**			
	Light-duty Truck	22.49	127.50	233.95	0.24	100.66	24.40	71354.37	1.07	0.17	71431.75
	Subtotal (lbs):	22	127	234	0	101	24	71,354	1	0	71,432
Travel to training areas - Annual Grand Total in Tons		**0.01**	**0.06**	**0.12**	**0.00**	**0.05**	**0.01**				
Travel to training areas - Annual Grand Total in Metric Tons								**32**	**0**	**0**	**32**

Alternative 1

On-road Equipment	Miles	Duration (kw-hr/hp-hr)	VOC g/VMT	CO g/kW-hr	NOx g/kW-hr	SO_2 g/VMT	PM_{10} g/hp-hr	$PM_{2.5}$ g/hp-hr	CO_2 g/kW-hr	CH4 g/VMT	N2O g/VMT	CO2e g/VMT
JLTV	33,271	11,592	0.31	2.00	6.30	0.0033	0.0707	0.0707	679.6800	0.0146	0.0024	-
			VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM10 lb**	**PM2.5 lb**	**CO_2 lb**			
		JLTV	22.49	51.11	161.00	0.24	1.81	1.81	17369.98	1.07	0.17	17431.80
		Subtotal (lbs):	22	51	161	0	2	2	17,370	1	0	17,432
Travel to training areas - Annual Grand Total in Tons			**0.01**	**0.03**	**0.08**	**0.00**	**0.00**	**0.00**				
Travel to training areas - Annual Grand Total in Metric Tons									**8**	**0**	**0**	**8**

Alternative 2

On-road Equipment	Miles	Duration (kw-hr/hp-hr)	VOC g/VMT	CO g/kW-hr	NOx g/kW-hr	SO_2 g/VMT	PM_{10} g/hp-hr	$PM_{2.5}$ g/hp-hr	CO_2 g/kW-hr	CH4 g/VMT	N2O g/VMT	CO2e g/VMT
JLTV	39,925	13,910	0.31	2.0000	6.3000	0.0033	0.0707	0.0707	679.6800	0.0146	0.0024	-
			VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM10 lb**	**PM2.5 lb**	**CO_2 lb**			
		JLTV	26.99	61.33	193.20	0.29	2.17	2.17	20843.98	1.28	0.21	20938.96
		Subtotal (lbs):	27	61	193	0	2	2	20,844	1	0	20,939
Travel to training areas - Annual Grand Total in Tons			**0.01**	**0.03**	**0.10**	**0.00**	**0.00**	**0.00**				
Travel to training areas - Annual Grand Total in Metric Tons									**9**	**0**	**0**	**9**

TOTALS

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb	CH4 lb	N2O lb	CO2e lb
Baseline	27.42	155.49	285.31	0.30	122.75	29.76	87017.52	1.30	0.21	87111.89
Subtotal (lbs):	27	155	285	0	123	30	87,018	1	0	87,112
Travel to training areas - Annual Grand Total in Tons	**0.01**	**0.08**	**0.14**	**0.00**	**0.06**	**0.01**				
Travel to training areas - Annual Grand Total in Metric Tons							39	0	0	40

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb	CH4 lb	N2O lb	CO2e lb
Alternative 1	34.83	102.22	322.01	0.38	3.61	3.61	34739.97	1.65	0.27	34835.70
Subtotal (lbs):	35	102	322	0	4	4	34,740	2	0	34,836
Travel to training areas - Annual Grand Total in Tons	**0.02**	**0.05**	**0.16**	**0.00**	**0.00**	**0.00**				
Travel to training areas - Annual Grand Total in Metric Tons							16	0	0	16

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb	CH4 lb	N2O lb	CO2e lb
Alternative 2	41.79	122.67	386.41	0.45	4.34	4.34	41687.96	1.98	0.32	41835.06
Subtotal (lbs):	42	123	386	0	4	4	41,688	2	0	41,835
Travel to training areas - Annual Grand Total in Tons	**0.02**	**0.06**	**0.19**	**0.00**	**0.00**	**0.00**				
Travel to training areas - Annual Grand Total in Metric Tons							19	0	0	19

TAB D. GHG Analysis

Construction GHG Emissions Alt 1	*CO2e (metric tons)*	GHG Social Cost (3%)	Social Cost-GHG 95th Percentile
Year 1 (2025)	1,086	$ 61,258	$ 183,655
Year 2 (2026)	936	$ 53,827	$ 161,664
Year 3 (2027)	707	$ 41,427	$ 124,634
Year 4 (2028)	704	$ 41,995	$ 126,554
Year 5 (2029)	717	$ 43,528	$ 131,381
Year 6 (2030)	710	$ 43,823	$ 132,476
Year 7 (2031)	719	$ 45,229	$ 136,988
Year 8 (2032)	697	$ 44,670	$ 135,547
Total	6,277	$ 375,755	$ 1,132,899

Alt 1

Activity	*CO2e (metric tons)*
Baseline Annual Operational GHG Total	39.5
25-year lifecycle emissions	988
Alt 1 Annual Operational GHG Total	15.8
25-year lifecycle emissions	395.0
Annual GHG Net Change After Construction	-23.7
25-year net change lifecycle emissions	-593

Alt 2

Activity	*CO2e (metric tons)*
Baseline Annual GHG Total	39.5
25-year lifecycle emissions	988
Alt 2 Annual GHG Total	19.0
25-year lifecycle emissions	474.4
Annual GHG Net Change After Construction	-20.5
25-year net change lifecycle emissions	-513

Alt 1			
	CO2		
2025	$56		$889
2050	$85	16	$1,334
2025	$169		$2,666
2050	$260	16	$4,096
	CH4		
2025	$1,720		$1
2050	$3,067	0.001	$2

2025	$4,548		$3
2050	$8,175	0.001	$6
	N2O		
2025	$20,591		$3
2050	$32,989	0.0001	$4
2025	$54,295		$7
2050	$88,166	0.0001	$11
	CO2e		
2025			$893
2050			$1,340
2025			$2,676
2050			$4,113

Alt 2

	CO2		
2025	$56		$1,067
2050	$85	19	$1,601
2025	$169		$3,199
2050	$260	19	$4,915
	CH4		
2025	$1,720		$2
2050	$3,067	0.001	$3
2025	$4,548		$4
2050	$8,175	0.001	$7
	N2O		
2025	$20,591		$3
2050	$32,989	0.0001	$5
2025	$54,295		$8
2050	$88,166	0.0001	$13
	CO2e		
2025			$1,071
2050			$1,608
2025			$3,211
2050			$4,936