Pacific Missile Range Facility Enhanced Capability
Final Environmental Impact Statement
December 1998

Volume 1

The annotated version of Volume 1 contains links to reference documents as well as links to several sections within the PMRF FEIS. The links are located in the right hand margin. Clicking on the link will open the associated document or section.

- Numeric links correspond to the reference number found in the document's reference list. Numbers may range from 1 – 222.
- Section numbers preceded by an "s" (s 4.2.1.1) are linked to sections within the document. Currently, the Executive Summary is the only section linked in this manner.
- The appendix letter (app H) identifies a link to an appendix.

Volume 1 is "bookmarked" for quick access to the various section headings. The bookmarks are located on the left side of the Acrobat Reader window and are identified by the section's heading. To jump to a particular heading, click on the desired bookmark.

A Table of Annotated References precedes the Executive Summary as well as each chapter in Volume 1. The reference numbers in the Table of Annotated References are linked to their associated reference document. The page numbers identified in the Table of Annotated references are linked to the indicated page.

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Pacific Missile Range Facility Enhanced Capability

Final
Environmental Impact Statement

Volume 1 of 3

December 1998

PACIFIC MISSILE RANGE FACILIT
ENHANCED CAPABILIT
FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1 OF 3

December 1 8

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Commanding Officer
Pacific Missile Range Facility
P.O. Box 128
Kekaha, Hawaii 2- 128

COVER SHEET

ENVIRONMENTAL IMPACT STATEMENT

PACIFIC MISSILE RANGE FACILITY (PMRF) ENHANCED CAPABILITY

a. Lead Agency: U.S. Department of the Navy

b. Cooperating Agencies: U.S. Army U.S. Air Force Department of Energy Defense Special Weapons Agency Ballistic Missile Defense Organization

c. Proposed Action: Pacific Missile Range Facility Enhanced Capabilities

d. Affected Jurisdictions: Pacific Missile Range Facility, Kauai County, Hawaii Makaha Ridge, Kauai County, Hawaii Kokee Park, Kauai County, Hawaii Kamokala Magazines, Kauai County, Hawaii Port Allen, Kauai County, Hawaii Niihau, Kauai County, Hawaii Kaula, Honolulu County, Hawaii Maui Space Surveillance System, Maui County, Hawaii Kaena Point, Honolulu County, Hawaii Wheeler Network Segment Control, Honolulu County, Hawaii DOE Communication Sites, Kauai and Honolulu counties, Hawaii. Both Tern Island, Honolulu County, Hawaii and Johnston Atoll have been eliminated.

e. Inquiries on this document may be directed to: Ms. Vida Mossman, Pacific Missile Range Facility, P.O. Box 128, Kekaha, Kauai, Hawaii 2- 128, (8 8) 33 -

f. Designation: Final Environmental Impact Statement

g. Abstract: This EIS was prepared in accordance with the National Environmental Policy Act (NEPA), Hawaii Revised Statutes, and Executive Order 1211 , Environmental Effects Abroad of Ma or Federal Actions. Two alternatives the No-action Alternative and the Proposed Action were analyzed in this EIS. The No-action Alternative is the continuation of existing range and land-based training and operations existing research and development test and evaluation and ongoing base operations and maintenance at PMRF. The Proposed Action, the Preferred Alternative, would result in the continuation of PMRF existing activities and enhancement of the capabilities of PMRF that would allow theater ballistic missile defense (TBMD) testing and training and theater missile defense (TMD) testing. The enhancement would include upgrading existing radar and communications and constructing and operating additional missile launch sites, sensors and instrumentation facilities, and a missile storage magazine. The Proposed Action would also include the revision to an existing restrictive easement for 28 years over State of Hawaii land to allow the U.S. Government to clear a ground hazard area during missile launch activities. The locations where activities would occur are listed in Item d above.

This EIS addresses the potential environmental impacts that would result from activities that would occur under the No-action Alternative and Proposed Action. Environmental resource topics evaluated include air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, water resources, the ocean area, and environmental ustice. The potential cumulative effects of each of these resources were also evaluated.

In compliance with HRS 3 3, any new information, clarification, and deletions made between a Draft Environmental Impact Statement (EIS) and a Final EIS are to be highlighted to aid the reader (the public) in finding these changes. To highlight the changes in this EIS, additions have been underlined and deletions have been crossed-out. Minor grammatical and stylistic edits to the original Draft EIS have been made, but are not highlighted. Changes to the Executive Summary have not been highlighted, as it presents the results of this Final EIS.

Ref. No.	Reference	Page #	¶	Line
132	U.S. Army Space and Strategic Defense Command, 1994. *Theater Missile Defense Extended Test Range Draft Environmental Impact Statement*, *Volume II*, January.	Es-2	6	8
171	U.S. Department of the Navy, Theater Air Defense Program Executive Office, PEO(TAD)-B, 1996. *Draft Navy TBMD Program Range Upgrade Requirements,* 3 December.	Es-2	7	2
163	U.S. Department of the Navy, 1980. *Department of the Navy Environmental Impact Assessment Kaula Island Target Hawaii*, Commander, Naval Air Forces, U.S. Pacific Fleet, 20 February.	Es-9	8	5
163	U.S. Department of the Navy, 1980. *Department of the Navy Environmental Impact Assessment Kaula Island Target Hawaii*, Commander, Naval Air Forces, U.S. Pacific Fleet, 20 February.	Es-9	8	7

Executive Summary

EXECUTIVE SUMMARY

INTRODUCTION

This document is a oint State of Hawaii and United States Navy Environmental Impact Statement (EIS) that provides a comprehensive environmental analysis to support State and Federal decisions concerning the use of State, Federal, and private lands to support range enhancements at the Pacific Missile Range Facility (PMRF) at Barking Sands, Kauai, Hawaii and on Niihau, Hawaii. Since the State and Federal actions and decisions are interconnected, the analyses will be documented in this oint EIS. By providing for oint preparation, excessive paperwork is reduced. In addition, since actions are proposed to occur both inside and outside U.S. territorial waters, this document complies with both the National Environmental Policy Act (NEPA) (2 United States Code 3 1) and Executive Order (EO) 1211 , *Environmental Effects Abroad of Major Federal Actions.* s 1.1

Hawaii Revised Statutes (HRS) Chapter 3 3 and its implementing rules (Title 11, Chapter 2 , Hawaii Administrative Rules, Department of Health) require that systematic consideration be given to the environmental and social consequences of any State agency action, including the use of State or county lands. Use of State or county lands includes any grant of title, lease, permit, easement, license, or entitlement to those lands. The proposed use of State lands includes modification of the existing lease of exclusive easement granted by the State of Hawaii in 1 3 to the Navy regarding lands ad acent to PMRF. This modification would address missile launches that generate the need to utilize State lands as a ground hazard area and extend the term of that existing easement from 1 January 2 3 to 31 December 2 3 . This extension would bring this easement in conformity with other existing PMRF leases expiring in 2 2 and 2 3 . Other actions involving the use of state lands are the expansion of the Kamokala Magazine Area to include approximately 2 hectares (ha) (acres ac) of state land to support the construction of additional ordnance storage magazines and the establishment of an associated explosive safety restrictive use easement encumbering approximately ha (12 ac) of state land. The expansion of the magazine area would be accomplished either by an amendment of the existing state lease to include the additional land or by conveyance of the lands to the government in fee simple. The restrictive use easement would permit continued agricultural use of the lands but limit the construction of new buildings or other structures and prohibit public access to the area. If the proposed expansion is leased, then the lease and the safety easement expiration dates would be 1 August 2 2 . s 1.1

The NEPA the Council on Environmental Quality (CEQ) *Regulations Implementing the Procedural Provisions of the National Environmental Policy Act;* (Code of Federal Regulations CFR 1 -1 8), Department of Defense (DOD) Directive .1, *Environmental Effects in the United States of Department of Defense Actions* and Naval Operations Instruction (OPNAVINST) .1B, *Environmental and Natural Resources Program Manual*, direct the Navy and DOD officials to consider environmental consequences when making decisions to authorize or approve Federal actions. In addition, EO 1211 requires consideration of environmental effects in decisions for actions outside the United States or its territories. EO 128 8, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* requires Federal agencies to *s 1.1* analyze their programs as to disproportionately high and adverse human health and environmental effects on minority and low-income populations.

Since the Draft EIS was published, EO 13 8 , *Coral Reef Protection,* was signed to preserve and protect the biodiversity, health, heritage, and social and economic value of U.S. coral reef ecosystems and the marine environment. s 1.1

PURPOSE AND NEED FOR THE PROPOSED ACTION

This EIS analyzes the environmental impacts of the Navy s proposal to enhance the capability of PMRF to accommodate the Navy and other DOD Theater Missile Defense (TMD) testing, evaluation, and training. Congress has directed DOD to develop a highly effective TMD program to defend our armed forces abroad and our friends and allies from theater missile attacks. No fully effective defense against these missiles currently exists. However, theater missiles are being developed and/or purchased by many nations, some of which are not friendly. Congress tasked the DOD s Ballistic Missile Defense Organization (BMDO) to develop this system in cooperation with all elements of the U.S. Armed Services. s 1.2

Theater Ballistic Missile Defense (TBMD) is the name of the Navy program that is a part of the overall DOD TMD program. The Proposed Action would enable PMRF fully to accommodate the testing and training needs of the Navy s TBMD program and other DOD TMD programs as well. This proposed enhancement would also increase PMRF s viability in the future by providing increased capability for potential customers to develop, test, and train. s 1.1.1

The purpose of the proposed action is to comply with Congressional direction to enhance PMRF. This enhancement would provide PMRF with sufficient capabilities to allow development, testing, and evaluation of Navy TBMD and DOD TMD systems, as well as training of personnel in the use of these systems once they are introduced to the fleet. In order to evaluate the operational effectiveness of TBMD systems, the systems need to be tested against a simulated hostile environment. Targets are required which simulate the characteristics of incoming hostile missiles. Multiple simultaneous launches of airborne targets are required from different directions. To provide the correct target presentation, these target systems must be launched at distances up to 1,2 kilometers (km) (8 nautical miles nmi) from where TMD systems are located. s 1.2

Previous NEPA analyses supporting TMD extended test range decisions were conducted in 1 . The analyses focused on the Army s planned land-based interceptors and associated facility, instrumentation, and testing needs. PMRF was not carried forward because of limited instrumentation to support these land-based interceptor needs. This analysis focuses on those necessary instrumentation upgrades as well as conducting testing of ship-based interceptors. Subsequently, PMRF would then continue to support the normal fleet training missions of which TBMD intercepts will become a normal part. (U.S. Army Space and Strategic Defense Command, 1 , January) s 1.2 132

A requirements and range evaluation, which was conducted in 1 (U.S. Navy TBMD Sea Range Requirements and Range Evaluation, revised July 1) by the Navy Theater Air Defense Program determined that while all ranges lacked adequate instrumentation, s 1.2 1 1 overall, PMRF possessed the most capability to meet both the Navy s near-term and long-term technical TBMD test requirements.

No existing range can currently meet all Navy TBMD development, testing, evaluation and personnel training requirements. However, as published in Senate Report 1 3-321, of the Senate Appropriations Committee Subcommittee on Defense, stated: s 1.2

> The Committee recognizes that the Pacific M issile R ange F acility PMRF air, surface, and subsurface ranges and associated test and exercise infrastructure provide the unique capability to conduct virtually unrestricted test and evaluation in ideal conditions in support of the Defense Department, the armed services, the National Aeronautics and Space Administration, and U.S. friends and allies. Furthermore, the range is specifically equipped with the optical and radar tracking equipment, communications network, test control facilities, rock sic launch infrastructure, and range support capability necessary to support tests of theater missile defense systems and concepts. Based on these unique assets and PMRF s demonstrated record of success, the Committee directs that the Pacific Missile Range Facility (PMRF) shall be designated the primary test range for the completion of Navy lower tier and upper tier missile flight tests.

In addition, in Report 1 3- , the House of Representatives, Committee of Conference indicated its agreement with the Senate initiative to improve the capabilities of the Navy s Pacific Missile Range Facility and provided funding specifically for that purpose.

This EIS describes and evaluates the environmental consequences of the variety of ways in which the capabilities of PMRF may be enhanced in order to support Navy TBMD and DOD TMD development, testing, evaluation, and training.

Continued use of some State and private land by PMRF is needed to fully accomplish these ob ectives. For State lands, (1) the term of an existing restrictive easement needs to be extended and (2) the acquisition of some additional State land is proposed.

Revision of the existing restrictive easement involves only changes in the types of missile launches for which the easement may be used and in the number of years that the easement is in effect. The number of times that State property would be closed to public access would not change and the amount of State land involved would not change. The proposed acquisition or lease of some other State land would provide for additional explosives storage facilities and an associated safety zone.

NO-ACTION ALTERNATIVE AND PROPOSED ACTION

The No-action Alternative is the continuation of (1) existing range and land-based training and operations, (2) existing research, development, testing, and evaluation (RDT E) activities, and (3) ongoing base operations and maintenance of the technical and logistical facilities that support the training and operations missions conducted at PMRF. s 2.1

The Proposed Action assumes the continuation of existing activities at PMRF. The Proposed Action combines the activities of the No-action Alternative with slight increases in activities of a similar nature. The Preferred Alternative would include activities to enhance target and interceptor launch and instrumentation capabilities on air, sea, and land. In addition, the Preferred Alternative would provide for support activities including construction and/or modification of land facilities, acquisition of real property, and transportation of liquid propellants.

Areas originally considered for the launch and/or instrumentation sites included: (1) Kauai and Niihau, (2) other Pacific land-based support locations (Tern Island and Johnston Atoll), and (3) ocean areas within and outside U.S. territorial waters. Any testing and training would comply with current U.S. policy concerning compliance with treaties and international agreements.

Areas analyzed as part of the No-action Alternative and Proposed Action included PMRF s 2.2.1
(PMRF/Main Base Restrictive Easement (ground hazard area) Makaha Ridge Kokee
Kamokala Magazines and Port Allen, Kauai), PMRF support sites (Niihau Kaula Maui Space s 2.2.1.1
Surveillance System, Maui Kaena Point, Oahu Wheeler Network Segment Control/PMRF
Communication Sites, Oahu Department of Energy Communication Sites, Kauai and Oahu) s 2.2.1.2
candidate sites (Tern Island and Johnston Atoll) and Ocean Area (outside U.S. territory).

The Preferred Alternative includes construction and modification of target and interceptor s 2.3
launch facilities, launches of target and interceptor missiles, construction and modification of
instrumentation facilities, construction of support facilities, and transportation of missile
propellant. The Preferred Alternative also includes acquisition or lease of State lands ad acent
to PMRF to support launch and storage requirements. Specifically, the Navy is considering s 2.3.3.
launches of TBMD target missiles using Air Drop and Mobile Sea Platform capabilities from the
open ocean area around PMRF, construction of new target missile launch facilities at one or
more of five potential - by -meter (m) (1 - by 1 -foot ft) sites on PMRF with subsequent s 2.3.1
launches of TBMD target missiles from PMRF, and construction of up to two target and
interceptor missile launch facilities on Niihau (- by -m (1 - by 1 -ft) with launches to the s 2.3.1.3.2
open ocean area. Instrumentation capabilities would be established on Mobile Sea Platforms
as well as upgrade of the existing instrumentation capabilities at PMRF, Makaha Ridge, Kokee,
and Niihau (up to 1 by 1 m by ft). A new Missile Assembly Building (MAB) (12 by 21 s 2.3.1.3.3
m by ft) would be constructed on PMRF, and new ordnance storage facilities (1 by 3
m by ft) would be constructed on up to 2 ha (ac) of leased or acquired state land near
Kamokala Magazines. Road upgrades and relocation of the helicopter pad would occur at
Makaha Ridge. On Niihau, two communication and control sites would be established, clearing s .2.1
and leveling would be conducted to establish up to two Aerostat sites of five potential sites
(-m 1, -ft radius), and a 1,82 -m (, -ft) airstrip would be constructed. Liquid
propellant would be transported from the mainland to PMRF by air, sea, or land.   The Navy
prefers transportation of liquid propellants by air and would pursue waivers from the s .1.1. .2.2
Department of Transportation to allow this mode of transporting the propellant with sea
transportation being considered next if waivers are not attainable. Ongoing activities would be
continued at the other locations listed above as a part of the Preferred Alternative.

Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the s 2.3. .3
Navy has determined that they are not reasonable alternatives and therefore have been s 2.3. .
eliminated as proposed sites in the EIS. Review of the existing data available for Tern Island s 2.1
to support the assessment of the environmental effects of the Proposed Action at s 2.2.3

Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in the EIS, however, in order to preserve the work that has already been performed. s .3.1

The proposed use of State lands would occur under the Proposed Action. Under the Preferred Alternative, the use of State Lands would involve extending the term of the existing restrictive easement from 1 January 2 3 to 31 December 2 3 . The basic conditions of the restrictive easement (3 activations per year) would not change from those in the current agreement, except it would allow for the activation of the easement during missile launches to support both TBMD and TMD activities. Acquisition of an additional parcel of land ad acent to the Kamokala Magazines, either by amendment of the existing State lease or fee acquisition, and a restrictive use easement are needed in order that the Navy may construct additional ordnance storage facilities necessary to accommodate missile launch activities and prohibit further development of the lands affected by the explosive safety quantity-distance (ESQD) arcs around those additional ordnance facilities. s .1.

DECISIONS TO BE MADE

The decisions to be made by the State of Hawaii are (1) whether to revise the existing ground hazard area restrictive use easement with the Navy to expand the types of missile launches and extend the easement term from 1 January 2 3 to 31 December 2 3 and (2) whether to revise other Navy leases and/or convey land to the Navy and concur with or grant approvals as may be required for Navy use of lands to support the enhancement of PMRF to facilitate development and testing of TMD systems. The Department of Land and Natural Resources would be the accepting authority for the analysis, as well as the approval authority for the State Proposed Action. (1) s .1.2 (2) s .1.

PMRF would revise the current ground hazard area restrictive easement with the State of Hawaii for the continued use of lands for safety purposes ad acent to the facility for missile launching activities. In addition, PMRF would acquire an additional parcel of land, either in leasehold or fee, and restrictive use easement for the construction and use of two new ordnance storage magazines on Kauai. Neither the No-action Alternative nor the Preferred Alternative conflicts with any land use plans, policies, or controls.

Based on congressional direction to enhance the capabilities of PMRF, the NEPA-related decisions to be made by the Federal Government are (1) how to enhance the capabilities of PMRF to allow TMD testing, evaluation, and training for both the Navy TBMD program and other DOD programs within U.S. territorial waters. This enhancement would include the consideration of placing additional assets at PMRF and at off-range locations to support PMRF activities and (2) which remote sites to develop to support testing and training scenarios for Navy and other DOD TMD systems.

Table ES-1 is a matrix of the various alternative locations and activities forming the ma or decisions to be made by the Deputy Assistant Secretary of the Navy for Installations and Facilities.

Table ES-1: Decision Matrix

PREFERRED ALTERNATIVE / LOCATIONS* \ ACTIONS	TARGETS			INTERCEPTORS		INSTRUMENTATION				FACILITIES								REAL ESTATE		PROPELLANT TRANSPORTATION		
	AIR	SEA	LAND	SEA	LAND	AIR	SEA	LAND	AEROSTAT	MAB	CONTR CTR	MAG STOR	FUEL STOR	AIRFIELD	HELOPAD	MOORING	ROADS	LEASE/ACQUIRE	EASEMENT	AIR	SEA	SEA/ROAD **
AIR	X																			X		
SEA																						
AEGIS				X																		
MATSS		X					X		X		X											
SLP		X					X															
BARGE																					X	X
LAND																						
PMRF																						
SITE A			X		X			X														
SITE B			X		X			X														
SITE C			X		X			X														
SITE D			X		X			X														
SITE E			X		X			X														
SITE G													X									
SITE H										X												
SITE I										X												
GHA																			X			
KAMAKOLA MAGAZINES																						
STORAGE BUILDING (2)												X						X				
ESQD																			X			
MAKAHA RIDGE																						
SITE A								X									X					
SITE B								X									X					
SITE C								X														
SITE D								X			X				X							
KOKEE																						
SITE A								X														
SITE B								X														
SITE C								X														
PORT ALLEN																					X	X
NAWILIWILI HARBOR																					X	X
NIIHAU																						
SITE A			X		X																	
SITE B											X											
SITE C									X													
SITE D																X						
SITE E								X														
SITE F								X	X													
SITE G									X													
SITE H									X													
SITE I									X													
SITE J											X											
SITE K			X		X																	
SITE L																X						
SITE M														X								

* Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site.

** Not part of the Preferred Alternative

SCOPE OF THE STUDY

The EIS evaluates the potential environmental effects of the No-action Alternative and s 1. proposed enhancement of test and training capabilities of PMRF, including additional launch, instrumentation, and support sites and various levels of testing and training intensities. The EIS also discusses the potential impacts of revising the existing easement with the State of Hawaii for land ad acent to PMRF for an additional 28-year period as well as other potential land use agreements to provide for buffer zones ad acent to PMRF and an off-site storage facility. The EIS addresses all of the measurably foreseeable activities in the particular geographical areas affected by the No-action Alternative and the Proposed Action and focuses on the activities ripe for decision. Because the Proposed Action requires the use of State of Hawaii lands (revision of the restrictive easement and the potential use of other land), this EIS also assesses the environmental consequences of the Proposed Action in accordance with Hawaii law. The EIS embraces both Federal and State requirements and provides necessary analyses to allow agencies at all levels to consider the environmental effects of their decisions.

SUMMARY OF ENVIRONMENTAL IMPACTS

The EIS describes the potential environmental effects from implementing the No-action s . Alternative and the Proposed Action. The environment is analyzed in terms of 1 resource areas: air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetic resources, and water resources. In addition, an evaluation of the ocean area outside the territorial limits of the United States and an environmental ustice analysis were conducted. Each resource area is discussed at each location unless the No-action Alternative and Proposed Action activities at that location would not foreseeably result in an impact. The data presented are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts. For some locations, it was determined through initial evaluation that no impacts would occur. These sites are briefly discussed within the EIS and are summarized below. Table ES-2 provides a summary of the environmental consequences associated with the implementation of the No-action Alternative and Proposed Action at each of the locations evaluated. The environmental consequences of the State of Hawaii actions are included within the Restrictive Easement and Kamokala Magazines columns in table ES-2. Environmental consequences under the urisdiction of EO 1211 are included within the Ocean Area. The information in the table is based on the environmental impact analysis presented in chapter of this EIS. The levels of impacts shown in table ES-2 are defined as:

- **No Impact** No impact is predicted.
- **No Adverse Impact** An impact is predicted, but the impact, as mitigated, does not meet the intensity or context criteria needed to trigger a regulatory requirement or impact the quality of the human or natural environment.
- **Adverse Impact** An impact is predicted that meets the intensity or context criteria necessary to trigger a regulatory requirement or impact the quality of the human or natural environment.

Table ES-2: Summary of Potential Environmental Consequences

LOCATION [3]	PMRF/ Main Base		Restrictive Easement (Ground Hazard Area)		Makaha Ridge		Kokee		Kamokala Magazines		Port Allen		Niihau		Kaula		Kaena Point		Maui Space Surveillance System		Wheeler Network Segment Control/PMRF		DOE Comm. Sites		Ocean Area (Outside U.S. Territory)	
RESOURCE	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed	No-action	Proposed
Air Quality	△	△	△	△	△	△	△	△	□	△	△	△	△	△	□	□	□	□	□	□	□	□	□	□	□	□
Airspace	△	△	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□	□	□	□	□	□	□	□	□	△
Biological Resources	△	△	△	△	△	△	△	△	□	△	□	□	△	■	△	△	□	□	□	□	□	□	□	□	△	△
Cultural Resources	△	△	□	□	△	△	△	△	△	△	□	□	△	△	□	□	□	□	□	□	□	□	□	□	□	□
Geology and Soils	△	△	□	□	△	△	△	△	△	△	□	□	□	△	■ [2]	■ [2]	□	□	□	□	□	□	□	□	□	□
Hazardous Materials and Hazardous Waste	△	△	□	□	△	△	△	△	□	□	△	△	△	△	□	□	□	□	□	□	□	□	□	□	□	□
Health and Safety	△	△	□	□	△	△	△	△	△	△	△	△	△	△	△	△	□	□	□	□	□	□	□	□	□	△
Land Use	△	△	△	△	□	□	△	△	△	△	□	□	△	△	△	△	□	□	□	□	□	□	□	□	□	□
Noise	△	△	△	△	△	△	△	△	□	□	△	△	△	△	□	□	□	□	□	□	□	□	□	□	□	□
Socioeconomics	✚	✚	△	△	□	□	□	□	□	□	□	□	□	✚	□	□	□	□	□	□	□	□	□	□	□	□
Transportation	□	△	△	△	□	□	□	□	□	□	□	△	□	✚	□	□	□	□	□	□	□	□	□	□	□	□
Utilities	□	□	□	□	■ [1]	■ [1]	■ [1]	■ [1]	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Visual and Aesthetics	△	△	□	□	△	△	△	△	□	△	□	□	△	△	□	□	□	□	□	□	□	□	□	□	□	□
Water Resources	△	△	□	□	□	□	△	△	△	△	□	□	□	△	□	□	□	□	□	□	□	□	□	□	□	□
Environmental Justice	△	△	△	△	□	□	□	□	□	□	□	□	△	△	□	□	□	□	□	□	□	□	□	□	□	□

EXPLANATION

□ **No Impact**: No impact is predicted.

△ **No Adverse Impact**: An impact is predicted, but the impact does not meet the intensity or context criteria needed to trigger a regulatory requirement or impact the quality of the human or natural environment.

■ **Adverse Impact**: An impact is predicted that meets the intensity or context criteria necessary to trigger a regulatory requirement or impact the quality of the human or natural environment, unless mitigated.

✚ **Beneficial Impact**: An impact is predicted to have a beneficial effect on the quality of the human or natural environment.

Notes:

[1] Both on-going and proposed activities would continue to contribute to the existing water shortage until a new well is on-line within one to two years.

[2] Adverse impact due to permanent adverse soil and geologic effects from past ordnance explosions.

[3] Tern Island and Johnston Atoll have been eliminated from this table.

- **Beneficial Impact** An impact is predicted to have a beneficial effect on the quality of the human or natural environment.

There are no unresolved issues to the No-action Alternative and Proposed Action.

A listing of State of Hawaii permits or approvals is contained in appendix H, Potential Permits, Licenses, and Entitlements Required. Laws and regulations considered are provided in appendix J. app H app J

The complete list of potential mitigation measures proposed to avoid, minimize, rectify, or reduce the possible impacts of the Proposed Action and the No-action Alternative is provided in appendix L. Also provided is a matrix of locations and mitigations for the Proposed Action. app L

No-action Alternative

Under the No-action Alternative, activities at three locations (Makaha Ridge, Kokee, and Kaula) evaluated in this EIS were predicted to have adverse impacts (see table ES-1). For each location analyzed in the EIS, potential adverse impacts are discussed below. For all remaining locations, either no impacts or no adverse impacts were predicted to arise from implementation of the No-action Alternative.

Makaha Ridge. For utilities, on-going activities at Makaha Ridge would continue to have an adverse impact on the water shortage that exists in the water supply system that supplies water to Makaha Ridge from the State of Hawaii water main at Kokee State Park until a new well is on-line within 1 to 2 years. Currently a mandatory water conservation program is in effect. s .1.3.13.1

Kokee. For utilities, on-going activities at Kokee Park would continue to have an adverse impact on the water shortage that exists in the water supply system that supplies water from the State of Hawaii water main at Kokee Park, the same system that supplies Makaha Ridge. This is expected to continue until a new well is on-line within 1 to 2 years. Currently a mandatory water conservation program is in effect. s .1. .13.1

Kaula. The No-action Alternative is the continued use of the southeast end of Kaula to train aviators in air-to-surface weapons delivery. Authorized ordnance includes aircraft cannon rounds. Permanent adverse soil and geologic effects have been noted by the Navy resulting from rock shattering explosions and the possibility of both live and inert ordnance (duds) which may remain in the target area (U.S. Department of the Navy, 1 8). The Navy minimizes the impact by managing the targeting to the southeast tip of the island, which encompasses approximately 8 percent of the total land mass (U.S. Department of the Navy, 1 8). s .2.2. .1 1 3 1 3

Proposed Action

Under the Proposed Action, activities proposed for five locations (Makaha Ridge, Kokee, Niihau, Kaula, and Tern Island) evaluated in the EIS were predicted to have adverse impacts. For each of these locations the adverse impacts are discussed below. Either no impacts or no adverse impacts to any of the environmental resources analyzed in the EIS from implementation of the Proposed Action would be expected for the remaining locations.

Makaha Ridge. Proposed activities would not result in an increase in the amount of water use at Makaha Ridge. However, the existing adverse impacts to the water supply may continue until a new well is drilled. s .1.3.13.2

Kokee. Proposed activities would not result in an increase in the amount of water use at Kokee. However, the existing adverse impacts to the water supply may continue until a new well is drilled. s .1. .13.2

Niihau. Activation of the proposed operating area over either proposed Aerostat site or missile launch sites on Niihau would have the potential to impact the V-1 en route low altitude airway that crosses the middle of the island. The proposed . -km (3-nmi) radius Restricted Area, from ground level to ,182 m (1 , ft) surrounding both proposed sites would lie within the boundaries of the airway, which extends from the surface up to, but not including , 8 m (18, ft) mean sea level, and . km (nmi) either side of the airway s center line. Therefore, whenever an operation is scheduled, the proposed Altitude Reservation would be activated, and air traffic using the V-1 airway would be required to use an alternate flight course. This would represent a potentially adverse impact on other regional airways (such as closing a road and forcing traffic to use an alternate route). s .2.1.2.2.

Adverse impacts to marine biological resources may occur. Additional traffic at the existing logistics landing sites and other landing craft landing areas may disturb monk seals that haul out to bask, or possibly pup, on the sandy beach areas. Disturbance of green sea turtle nesting sites at the existing logistics landing sites and other sandy beach areas could also occur. However, the operational activities of the Proposed Action are not expected to affect viability or eopardize the continued survival of either of these two sensitive species.

Kaula. Because no activities are planned for Kaula other than those described in the No-action Alternative, no additional soil and geologic impacts are anticipated. s .2.2. .2

Tern Island. Although Tern Island was originally a site alternative in the Draft EIS, the Navy has determined that it is not a reasonable alternative and therefore has been eliminated as a proposed site in the Final EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The determination that Tern Island is no longer a reasonable alternative takes precedence over the other discussions concerning Tern Island in the Final EIS. s .3.1

Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS

1 ACS	1th Air Control Squadron
1 OG	1th Operations Group
1 WG	1th Wing
AAME	Air-to-Air Missile Exercise
AAQS	Ambient Air Quality Standards
AAWE	Anti-Air Warfare Exercise
ac	Acre
ACHP	Advisory Council on Historic Preservation
ACME	Air Combat Maneuver Exercise
AF	Air Force
AFB	Air Force Base
AFI	Air Force Instruction
AFS	Air Force Station
AFTO	Air Force Toxic Program
AGL	Above Ground Level
AHERA	Asbestos Hazard Emergency Act
AICU	Air Installation Compatible Use one
AIRASWE	Air Anti-Submarine Warfare Exercise
Al_2O_3	Aluminum Oxide
ALI	AEGIS LEAP Intercept
ALISH	Agricultural Lands of Importance to the State of Hawaii
ALTRV	Altitude Reservation
AMPHIBE	Amphibious Exercise
AMOS	Air Force Maui Optical Station

AMPS	Autonomous Mobile Periscope System
ANSI	American National Standards Institute
AP	Ammonium Perchlorate
APAN	AEGIS Performance Assessment Network
ARTCC	Air Route Traffic Control Center
ASME	Air-to-Surface Missile Exercise
ASOS	Automatic Surface Observation System
ASRM	Advanced Solid Rocket Motor
ASWE	Anti-submarine Warfare Exercise
ASW	Anti-submarine Warfare
ATCAA	Air Traffic Control Assigned Airspace
BARSTUR	Barking Sands Tactical Underwater Range
BEQ	Bachelor s Enlisted Quarters
BMD	Ballistic Missile Defense
BMDO	Ballistic Missile Defense Organization
BOD	Biological Oxygen Demand
BOSS	Base Operation Support Services
BSURE	Barking Sands Underwater Range Expansion
°C	Degrees Celsius
C I	Command, Control, Communications, Computer, and Intelligence
CAP	Contaminant Assessment Process
CBRA	Coastal Barriers Resources Act
CEC	Cooperative Engagement Capability
CERAP	Combined Center Radar Approach Control
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality

CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CHRIMP	Consolidated Hazardous Materials Reutilization and Inventory Management Program
CINC	Commander-in-chief
cm	Centimeter(s)
CNO	Chief of Naval Operations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COMPMTCINST	Commander Pacific Missile Test Center Instruction
COMPTUE	Composite Training Underway Exercise
CONUS	Continental United States
COSIP	Coherent Signal Processing
CRMP	Cultural Resources Management Plan
CSSQT	Combat System Ship Qualification Trial
CTV	Controlled Test Vehicle
CWA	Clean Water Act
dB	Decibel(s)
dBA	A-weighted Decibel
dBC	C-weighted Decibel
DCTN	Defense Commercial Telecommunications Network
DEIS	Draft Environmental Impact Statement
DGPS	Differential Global Positioning System
DISN	Defense Information System Network
DLNR	Department of Land and Natural Resources
DNA	Defense Nuclear Agency
DNL	Day-night Average Sound Level

DOD	Department of Defense
DODDIR	Department of Defense Directive
DOE	Department of Energy
DOH	Department of Health
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
DSWA	Defense Special Weapons Agency
E2	Electronic Electromechanical
EA	Environmental Assessment
ECM	Electromagnetic Countermeasure
ECME	Electronic Countermeasures Exercise
ED	Exoatmospheric Discrimination Experiment
EED	Electro-explosive Device
EIS	Environmental Impact Statement
EI	Elevation
EMR	Electromagnetic Radiation
EO	Executive Order
EOD	Explosive Ordnance Disposal
EODMU	Explosive Ordnance Disposal Mobile Unit
EPCRA	Emergency Planning and Community Right-to-Know Act
ERINT	Extended Range Intercept Technology
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity-Distance
EW	Electronic Warfare
EWE	Electronic Warfare Exercise
°F	Degrees Fahrenheit

FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FAR	Federal Aviation Regulations
FAST	Floating At Sea Target
FEMA	Federal Emergency Management Agency
FL	Flight Level
FMA	Foreign Material Asset
FMS	Foreign Military Sales
ft	Foot (Feet)
FTS	Flight Termination System
F	Fiscal ear
gal	Gallon(s)
GBR	Ground-based Radar
GEODSS	Ground-based Electro-optical Deep Space Surveillance System
GHA	Ground Hazard Area
gpd	Gallons Per Day
GPS	Global Positioning System
GUNNE	Gunnery Exercise
H_2	Hydrogen (gas)
H_2O	Water
ha	Hectare
HAP	Hazardous Air Pollutant
HAR	Hawaii Administrative Rule
HARP	Historical and Archeological Resources Protection
HARPOONE	Harpoon Anti-Surface Missile Exercise
HATS	Hawaiian Area Tracking System

HA MINCEN	Hazardous Materials Minimization Center
HCl	Hydrogen Chloride
HDMS	Hawaii Digital Microwave System
HERF	Hazards of Electromagnetic Radiation to Fuels
HERO	Hazards of Electromagnetic Radiation to Ordnance
HERP	Hazards of Electromagnetic Radiation to Personnel
HF	High Frequency
HIANG	Hawaii Air National Guard
HIHWNMS	Hawaiian Islands Humpback Whale National Marine Sanctuary
HINWR	Hawaiian Islands National Wildlife Refuge
HIROC	Hawaii Regional Operations Center
HLB	Hypersonic Lifting Body
HRS	Hawaii Revised Statutes
HSMST	High Speed Mobile Surface Target
HTPB	Polybutadiene Rubber Binder
HW	Highway
H DROPAC	Navigational Warning to Mariners in the Pacific
ICAO	International Civil Aviation Organization
ICBM	Intercontinental Ballistic Missile
ICRMP	Integrated Cultural Resources Management Plan
IDLH	Immediately Dangerous to Life and Health
IFF	Identification-friend-or-foe
IFLOTS	Intermediate Focal Length Optical Tracking System
IFR	Instrument Flight Rules
in.	Inch(es)
IRFNA	Inhibited Red Fuming Nitric Acid

IRP	Installation Restoration Program
ISTT	Improved Surface Tow Target
ITCS	Integrated Target Control System
JACADS	Johnston Atoll Chemical Agent Disposal System
JANWR	Johnston Atoll National Wildlife Refuge
KCOSA	Kamokala Caves Ordnance Storage Area
KEASA	Kauai Educational Association of Science and Astronomy
kg	Kilograms
km	Kilometer
km^2	Square Kilometers
KTF	Kauai Test Facility
kV	Kilovolt
kVA	Kilovolt Ampere
kW	Kilowatt
L	Liter(s)
LARC	Light Amphibious Reconnaissance Craft
lb	Pound(s)
LC	Launch Complex
L_{dn}	Day-night Average Sound Level
L_{max}	Maximum Sound Level
LAMPS	Light Airborne Multi-Purpose System
LATR	Large Area Tracking Range
LC	Launch Complex
LCA	Land Commission Awards
LCAC	Landing Craft Air Cushion
LCU	Landing Craft, Utility

LFTT	Low Fidelity Test Targets
LHA	Launch Hazard Area
LORAN	Long-range Aid to Navigation
LOS	Launch Observation Ship
m	Meter
MACT	Maximum Applicable Control Technology
MATSS	Mobile Aerial Target Support System
MCBH	Marine Corp Base Hawaii
MCD-~~L~~US	Minimum Cost Design ~~Liquid~~ Upper Stage
MEADS	Medium Extended Air Defense System
MEFE	Middle East Force Exercise
MHPCC	Maui High Performance Computing Center
MHz	Megahertz
mi	Mile
mi^2	Square Miles
MINE	Mine Exercises
MIPIR	Missile Precision Instrumentation Radar
MIUW	Mobile Inshore Undersea Warfare
MIUWE	Mobile Inshore Undersea Warfare Exercise
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOA	Military Operations Area
MOGAS	Motor Vehicle Gasoline
MOTIF	Maui Optical Tracking and Identification Facility
MOTR	Multiple Ob ect Tracking Radar
MSL	Mean Sea Level

MSDS	Material Safety Data Sheets
MSSS	Maui Space Surveillance System
MT	Multi-threat Exercise
MW	Megawatts
MWR	Morale, Welfare and Recreation
N_2	Nitrogen (gas)
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation
NAS	National Airspace System
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NAVMAG LLL	Naval Magazine, Lualualei
NAWCWPNSINST	Naval Air Warfare Center Weapons Division Instruction
NE	Northeast
NEPA	National Environmental Policy Act
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NGSS	Naval Gunfire Scoring System
NHPA	National Historic Preservation Act
NMFS	Nationals Marine Fisheries Service
nmi	Nautical Mile
nmi^2	Square Nautical Miles
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NPDES	National Pollutant Discharge Elimination System

NRC	National Research Council
NTO	Nitrogen Tetroxide
NUWC	Naval Undersea Warfare Center
NWR	National Wildlife Refuge
OEA	Overseas Environmental Assessment
OEQC	Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs
ONR	Office of Naval Research
OPNAVINST	Naval Operations Instruction
OSHA	Occupational Safety and Health Administration
OTH-T	Over-the-Horizon Targeting
O /LB	Ounces per Pound
PAAT	PATRIOT-as-a-Target
PAC-2	PATRIOT Advanced Capability-2
PAC-3	PATRIOT Advanced Capability-3
PAN	Performance Assessment Network
PATRIOT	Phased Array Tracking to Intercept of Targets
Pb	Lead
PCB	Polychlorinated Biphenyl
PDT T	Post Delivery Test and Trials
PENGUINE	Penguin Anti-Surface Missile Exercise
PIA	Primary Impact Area
PL	Public Law
PM	Particulate Matter
PM-1	Particulate Matter with an Aerodynamic Diameter of Less than or Equal to 1 Micrometers
PMRF	Pacific Missile Range Facility

PMRF LC	Pacific Missile Range Facility Launch Complex
PMRFINST	Pacific Missile Range Facility Instruction
POP	Performance Oriented Packaging
ppm	Parts Per Million
PRT T	Post Regular Overhaul Training and Testing
psi	Pounds Per Square Inch
PTS	Permanent Threshold Shift
RANGE	Range Exercise
RATO	Rocket-assisted Take-off
RCC	Range Commanders Council
RCRA	Resource Conservation and Recovery Act
RDT E	Research, Development, Test, and Evaluation
RF	Radio Frequency
RIMPAC	Rim-of-the-Pacific Exercise
ROCC	Range Operations Control Center
ROD	Record of Decision
ROI	Region of Influence
SAGE	Surface-to-Air Gunnery Exercise
SAM	Surface-to-Air Missile
SAME	Surface-to-Air Missile Exercise
SARA	Superfund Amendments and Reauthorization Act
SAR	Specific Absorption Rate
SCAMP	Spacecraft Antenna on Medium Pedestal
SDWA	Safe Drinking Water Act
sec	Seconds
SEIS	Supplemental Environmental Impact Statement

SEPTAR	Seaborne Powered Target
SH	State Highway
SHPO	State Historic Preservation Officer
SIHP	State Inventory of Historic Places
SINKE	Sinking Exercise
SKOL	Sandia Kauai Operational Launch
SLMME	Submarine-Launched Mobile Mines Exercise
SLP	Sea Launch Platform
SM	Standard Missile
SNL	Sandia National Laboratories
SOP	Standard Operating Procedures
SPAWARS SCEN	Space and Naval Warfare Systems Center
SPCC	Spill Prevention Control and Countermeasures
SPEGL	Short-term Emergency Guidance Level
SPL	Sound Pressure Level
SRM	Solid Rocket Motor
SSEIS	Second Supplemental Environmental Impact Statement
SSME	Surface-to-Surface Missile Exercise
STARS	Strategic Target System
STEL	Short-term Exposure Limit
STTS	Submarine Target Tracking System
SUBE	Submarine Warfare Exercise
SW	Southwest
SWTR	Shallow Water Training Range
T C	Tracking and Command
TBM	Theater Ballistic Missile

TBMD	Theater Ballistic Missile Defense
TCP	Training and Certification Program
THAAD	Theater High Altitude Area Defense
TLV	Threshold Limit Value
TMD	Theater Missile Defense
TRACKE	Tracking Exercises
TSCA	Toxic Substances Control Act
TSP	Total Solid Particulate
TSTA	Tailoring Ships Training Availability
TTS	Temporary Threshold Shift
TWR	Torpedo Weapons Recovery
UAVS	Unmanned Aerial Vehicle System
UDMH	Unsymmetrical Dimethyl Hydrazine
UDT	Underwater Demolition Teams
UHF	Ultra High Frequency
URL	Uniform Resource Locator
USACE	United States Army Corps of Engineers
USAKA	United States Army Kwa alein Atoll
USB	Unified S-Band
USC	United States Code
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USMC	United States Marine Corp
UST	Underground Storage Tank

V	Volt
VFR	Visual Flight Rules
VHF	Very High Frequency
VIP	Very Important Person
VLA	Vertical Launch Torpedo
VLB	Very Long Baseline
VLBI	Very Long Baseline Interferometry
VMT	Vehicle Mile Traveled
VOC	Volatile Organic Compound
WNSC	Wheeler Network Segment Control
WRB	Weapons Recovery Boat
WSAT	Surface Weapons Systems Accuracy Test
WSMR	White Sands Missile Range
WW II	World War II
HN	Honolulu

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171	U.S. Department of the Navy, Theater Air Defense Program Executive Office, PEO(TAD)-B, 1996. *Draft Navy TBMD Program Range Upgrade Requirements,* 3 December.	1-4	3	2

1.0 Purpose and Need

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

This document is a oint State of Hawaii and United States Navy Environmental Impact Statement (EIS) that provides a comprehensive environmental analysis to support State and Federal decisions concerning the use of State, Federal, and private lands to support range enhancements at the Pacific Missile Range Facility (PMRF) at Barking Sands, Kauai, Hawaii and on Niihau, Hawaii. This EIS analyzes the environmental impacts of the Navy s proposal to enhance the capability of PMRF to accommodate the Department of Defense s (DOD) Ballistic Missile Defense (BMD) testing, evaluation, and training. Since the State and Federal actions and decisions are interconnected, the analyses will be documented in this oint EIS. By providing for oint preparation, excessive paperwork is reduced. In addition, since actions are proposed to occur both inside and outside U.S. territorial waters, this document complies with both the National Environmental Policy Act (NEPA) (2 USC   3 1) and Executive Order (EO) 1211 , *Environmental Effects Abroad of Major Federal Actions.*

Hawaii Revised Statutes (HRS) Chapter 3 3 and its implementing rules (Title 11, Chapter 2   , Hawaii Administrative Rules, Department of Health) require that systematic consideration be given to the environmental and social consequences of any State agency action, including the use of State or county lands. Use of State or county lands includes any grant of title, lease, permit, easement, license, or entitlement to those lands. The proposed use of State lands includes modification of the existing lease of exclusive easement granted by the State of Hawaii in 1   3 to the Navy regarding lands ad acent to PMRF. This modification would address missile launches that generate the need to utilize State lands as a ground hazard area and extend the term of that existing easement from 1 January 2   3 to 31 December 2 3 . This extension would bring this easement in conformity with other existing PMRF leases expiring in 2 2   and 2 3 . Another State action is the expansion of the current leased area at Kamokala Magazines Ordnance Storage Area (Kamokala Magazines) by approximately 2 hectares (ha) (acres ac) of state land to support the construction of additionalordnance storage magazines and the establishment of an associated explosive safety restrictive use easement encumbering approximately   ha (12   ac) of state land. The expansion of the magazine area would be accomplished either by an amendment of the existing state lease to include the additional land or by conveyance of the lands to the government in fee simple. ~~and the establishment of an associated safety easement limiting building of structures and habitation by the public, or commercial structures.~~ The current Kamokala Magazines lease ends on 1   August 2 2 . ~~Both~~ If the proposed expansion is leased, ~~and~~ then the lease and the safety easement expiration dates would be 1   August 2 2 .

The NEPA the Council on Environmental Quality (CEQ) *Regulations Implementing the Procedural Provisions of the National Environmental Policy Act,* (Code of Federal Regulations CFR 1   -1   8) DOD Directive   .1, *Environmental Effects in the United States of Department of Defense Actions* and OPNAVINST   .1B, *Environmental and Natural Resources Program Manual*, direct the Navy and DOD officials to consider environmental consequences when making decisions to authorize or approve Federal actions. In addition, EO 1211 requires consideration of environmental effects in decisions for actions outside the United States or its territories, i.e., beyond the ~~22.2-kilometer (km) (12-nautical-mile nmi)~~ territorial limits. EO 128 8, *Federal Activities to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires Federal agencies to analyze their programs as to disproportionately high and adverse human health and environmental effects on minority and low-income populations. Since the Draft EIS was published, EO 13 8 , *Coral Reef Protection,* was signed to preserve and protect the biodiversity, health, heritage, and social and economic value of U.S. coral reef ecosystems and the marine environment. The proposed Federal activities primarily involve the development of missile launch and instrumentation sites at locations remote from PMRF. These additional new test sites would allow DOD theater ballistic missile testing and evaluation programs, such as Theater Ballistic Missile Defense (TBMD) and other DOD Theater Missile Defense (TMD) programs, to be performed at PMRF. Sites considered in the Draft EIS included Tern Island, Johnston Atoll, and the privately owned Island of Niihau.

However, based on the review of existing data and analyses, coupled with comments from government agencies and the public regarding the sensitivity of Tern Island, has led the Navy to eliminate it from consideration as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis produced for this EIS have been retained within the document in order to preserve the work that has already been performed. The Navy s decision that Tern Island and Johnston Atoll are no longer reasonable alternatives takes precedence over discussions of the sites within this EIS.

Both State and Federal requirements recognize that overlap exists and allow for a single combined analysis. This EIS satisfies all of the requirements specified above and provides a complete analysis for decisionmakers at both the State and Federal level.

1.1.1 BACKGROUND

PMRF is the largest instrumented, multi-environment testing and training ocean range in the world. Activities on the range are monitored with real-time tracking and command/control capabilities located at or connected to the facilities at Barking Sands. This unique ocean range, combined with the highly technical instrumentation at the various base facilities, can simulate a realistic environment for testing and training in the use of air, submarine, and surface weapon systems as well as land-based weapon systems. Navy, Air Force, Army, Marine, and allied research, development, test, and evaluation (RDT E) programs and other non-DOD agencies, including commercial industry, all utilize PMRF. With new and improved combat systems and weapons under development, the requirement exists to expand the geographical area used by the range and enhance the range s capabilities to support testing of, and training with, these systems.

For the purposes of this document, references to PMRF Barking Sands include all current range assets and tenants on Kauai and at remote locations. PMRF is the standard reference for the land-based installations on Kauai, the underwater ranges, and their assets unless referring to a specific site or facility complex. PMRF on Kauai includes the main base complex (PMRF/Main Base), the Department of Energy (DOE) Kauai Test Facility

(KTF) as a tenant within the base complex, Makaha Ridge, Kokee, Kamokala Magazines, and the Navy activities at Port Allen. In addition, there are range assets on Niihau, Oahu, and Maui. The underwater ranges include the instrumented Barking Sands Tactical Underwater Range (BARSTUR), the Barking Sands Underwater Range Expansion (BSURE), the Hawaiian Area Tracking System (HATS), the new Shallow Water Training Range (SWTR), and the simulated underwater minefield. In this document, specific activities will be identified by location, such as: PMRF Launch Complex (LC).

TMD is the ability of the United States to defend its armed forces deployed abroad and its friends and allies against hostile missile attack in any theater of operations. In this context, a theater is a geographical area of military operations outside the United States. A theater missile is a ballistic missile (for example, a Scud-type missile), cruise missile, or air-to-surface guided missile launched and directed against a target located within a theater of operations.

TBMD is the Navy portion of the overall TMD program and is the ability of the U.S. Navy to defend U.S. forces deployed abroad, as well as U.S. friends and allies, against hostile missile attack. TBMD is designed to provide regional defenses to counter present and future conventional, chemical, biological, or nuclear ballistic, cruise, or air-to-surface guided missiles and aircraft or ram et threats that can endanger deployed U.S. forces as well as U.S. friends and allies throughout the world.

Congress has directed the DOD to develop a highly effective TMD program to defend forward deployed and expeditionary elements of the armed forces of the United States and U.S. friends and allies. The Ballistic Missile Defense Organization (BMDO) is tasked with development and production of BMD systems. The regional commanders-in-chief (CINCs) deploy these systems in the field for the defense of in-theater troops. Each service participates in developing and acquiring its respective TMD elements. The United States and its allies are developing new systems to deny hostile forces the effective use of their weapons.

While being developed, the Navy s TBMD systems will need to be tested and evaluated. These systems would be subsequently integrated and deployed with other Navy systems, or they could be combined with other developing TMD systems for integrated testing and training. Testing and training activities require a multi-threat environment with realistic, simulated hostile conditions, both in coastal areas and over a very large ocean area. Follow-on training for these new systems would be conducted in the same areas where testing occurred.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to comply with Congressional direction to enhance PMRF. This enhancement would provide PMRF with sufficient capabilities to allow development, testing, and evaluation of Navy TBMD and DOD TMD systems, as well as training of personnel in the use of these systems once they are introduced to the fleet. In order to evaluate the operational effectiveness of TBMD systems, the systems need to be tested against a simulated hostile environment. Targets are required which simulate the characteristics of incoming hostile missiles. Multiple simultaneous launches of airborne targets are required from different directions. To provide the correct target presentation, these target systems must be launched at distances up to 1,2 km (8nmi) from where TMD systems are located.

Previous NEPA analyses supporting TMD extended test range decisions were conducted in 1 . The analyses focused on the Army s planned land-based interceptors and associated facility, instrumentation, and testing needs. PMRF was not carried forward because of limited instrumentation to support these land-based interceptor needs. This analysis focuses on those necessary instrumentation upgrades as well as conducting testing of ship-based interceptors. Subsequently, PMRF would then continue to support the normal fleet training missions of which TBMD intercepts will become a normal part. (U.S. Army Space and Strategic Defense Command, 1 , January) 132

A requirements and range evaluation, which was conducted in 1 (U.S. Navy TBMD Sea Range Requirements and Range Evaluation, revised July 1) by the Navy Theater Air 1 1
Defense Program determined that while all ranges lacked adequate instrumentation, overall PMRF possessed the most capability to meet both the Navy s near-term and long-term technical TBMD test requirements.

No existing range can currently meet all Navy TBMD development, testing, evaluation, and personnel training requirements. However, as published in Senate Report 1 3-321, of the Senate Appropriations Committee Subcommittee on Defense, stated:

> The Committee recognizes that the Pacific M issile R ange F acility PMRF air, surface, and subsurface ranges and associated test and exercise infrastructure provide the unique capability to conduct virtually unrestricted test and evaluation in ideal conditions in support of the Defense Department, the armed services, the National Aeronautics and Space Administration, and U.S. friends and allies. Furthermore, the range is specifically equipped with the optical and radar tracking equipment, communications network, test control facilities, rock sic launch infrastructure, and range support capability necessary to support tests of theater missile defense systems and concepts. Based on these unique assets and PMRF s demonstrated record of success, the Committee directs that the Pacific Missile Range Facility (PMRF) shall be designated the primary test range for the completion of Navy lower tier and upper tier missile flight tests.

In addition, in Report 1 3- , the House of Representatives, Committee of Conference indicated its agreement with the Senate initiative to improve the capabilities of the Navy s Pacific Missile Range Facility and provided funding specifically for that purpose.

This EIS describes and evaluates the environmental consequences of the variety of ways in which the capabilities of PMRF may be enhanced in order to ~~fully~~ support Navy TBMD and DOD TMD development, testing, evaluation, and training.

The proposed uses of State and private lands and other PMRF enhancements would provide the capability for PMRF to conduct the necessary testing and training to develop and field effective TMD systems successfully. For State lands, the revision of the existing ground hazard area restrictive use easement for an additional 28 years at PMRF is needed to allow the U.S. Government to continue to clear the ground hazard area (safety zone) of non-participants for missile launches at PMRF. Acquisition of an additional parcel of land ad acent to the Kamokala Magazines, either by amendment of the existing State lease or fee acquisition, and a restrictive use easement are needed in order thatthe Navy may construct additional ordnance storage facilities necessary to accommodate missile launch activities and prohibit further development of the lands affected by the explosive safety quantity-distance (ESQD) arcs around those additional ordnancefacilities. ~~Revision of the lease of State lands for an additional 31 years at the Kamokala Magazines, Kauai, is also needed to permit the Navy to construct additional ordnance storage facilities to accommodate missile launch activities, and to include an easement for the associated explosive safety quantity-distance (ESQD) arcs around the ordnance storage facilities for the same 31 years.~~ These State actions would support potential Navy decisions on how to enhance the capability of PMRF, and thus allow testing and evaluation of Navy TBMD and DOD TMD systems that are under development.

1.3 COOPERATING AGENCIES

The following Federal agencies are cooperating agencies in the preparation of this EIS:

- Department of the Air Force (AF)
- Department of Energy (DOE)
- Defense Special Weapons Agency (DSWA)
- Ballistic Missile Defense Organization (BMDO)
- Department of the Army

Copies of acceptance letters are presented in appendix I.

1.4 DECISION(S) TO BE MADE

The decisions to be made by the State of Hawaii are:

- Whether to modify the State s existing lease of exclusive easement to the Navy to address missile launches that generate the need to utilize State lands as a ground hazard area restrictive use easement and extend the term of that existing easement from 1 January 2 3 to 31 December 2 3

- Whether to revise other Navy leases and/or convey land to the Navy and concur with determinations or grant approvals as may be required for Navy use of State lands in support of the enhancement of PMRF to facilitate development and testing of TMD systems

The ~~Governor of Hawaii~~ Department of Land and Natural Resources would be the accepting authority for the analysis, as well as the approval authority for the State Proposed Action.

Based on Congressional direction to enhance the capabilities of PMRF, the NEPA-related decisions to be made by the Federal Government are:

- How to enhance the capabilities of PMRF to allow TMD testing, evaluation, and training for the Navy TBMD, TMD program, and other related DOD programs within the United States and territorial waters. ~~(22.2 km 12 nmi).~~ This enhancement would include the consideration of placing additional assets at PMRF and at off-range locations to support PMRF activities

- Which remote sites to develop to support testing and training scenarios for Navy and other DOD TMD systems

The decisionmaker for the Federal Government is the Deputy Assistant Secretary of the Navy for Installations and Facilities. Figure 1. -1 depicts the multiple tiers of decisions to be made to support the enhancement of PMRF and off-range locations. The decisions associated with the Preferred Alternative are highlighted in the figure and are described below.

Target launch capabilities include air, sea, and land alternatives. Air launch capabilities would involve air drop over the open ocean sea launch capabilities could include Mobile Aerial Target Support System (MATSS) and/or Sea Launch Platform (SLP) vessels and land launch capabilities could be staged from any of five sites at PMRF, and either of two sites on Niihau.

Interceptor launch capabilities include sea and land alternatives. Sea capabilities would include AEGIS ocean launch and land launch capabilities could be staged from any of five sites at PMRF and either of two sites on Niihau. PMRF interceptors launch options are as flexible as those for targets. Most are mobile launcher systems from other DOD services. They use any open flat surface or existing pad as long as they can function inside of the current modified 3, 8-meter (m) (1 , -foot ft) ground hazard area for PMRF or the , -m (2 , -ft) ground hazard area proposed for Niihau.

Instrumentation capabilities include sea and land alternatives. MATSS could provide ocean/near-shore capabilities for instrumentation systems as well as Aerostat operations, while SLP could provide open ocean instrumentation. Land instrumentation capabilities could be provided from any of five sites at PMRF, any of four sites at Makaha Ridge, any of three sites at Kokee, and any of five Aerostat sites and two optics sites on Niihau.

Existing and or new/upgrade land facilities could be provided at four alternative locations. These alternatives include three facilities at PMRF, one additional storage site at Kamokala Magazines, a road upgrade and heliport relocation at Makaha Ridge, and five sites on Niihau.

Real property decisions include a leased/acquired parcel and/or ESQD easement at Kamokala Magazines an extended term for the ground hazard area easement for State lands ad acent to PMRF and Amfac Sugar-Kauai, as well as not limiting the types of missiles launched as long as they are able to function in the modified 3, 8-m (1 , -ft) ground hazard area.

Figure 1.4-1 (Sheet 1 of 4): Decisions by Activities (Added)

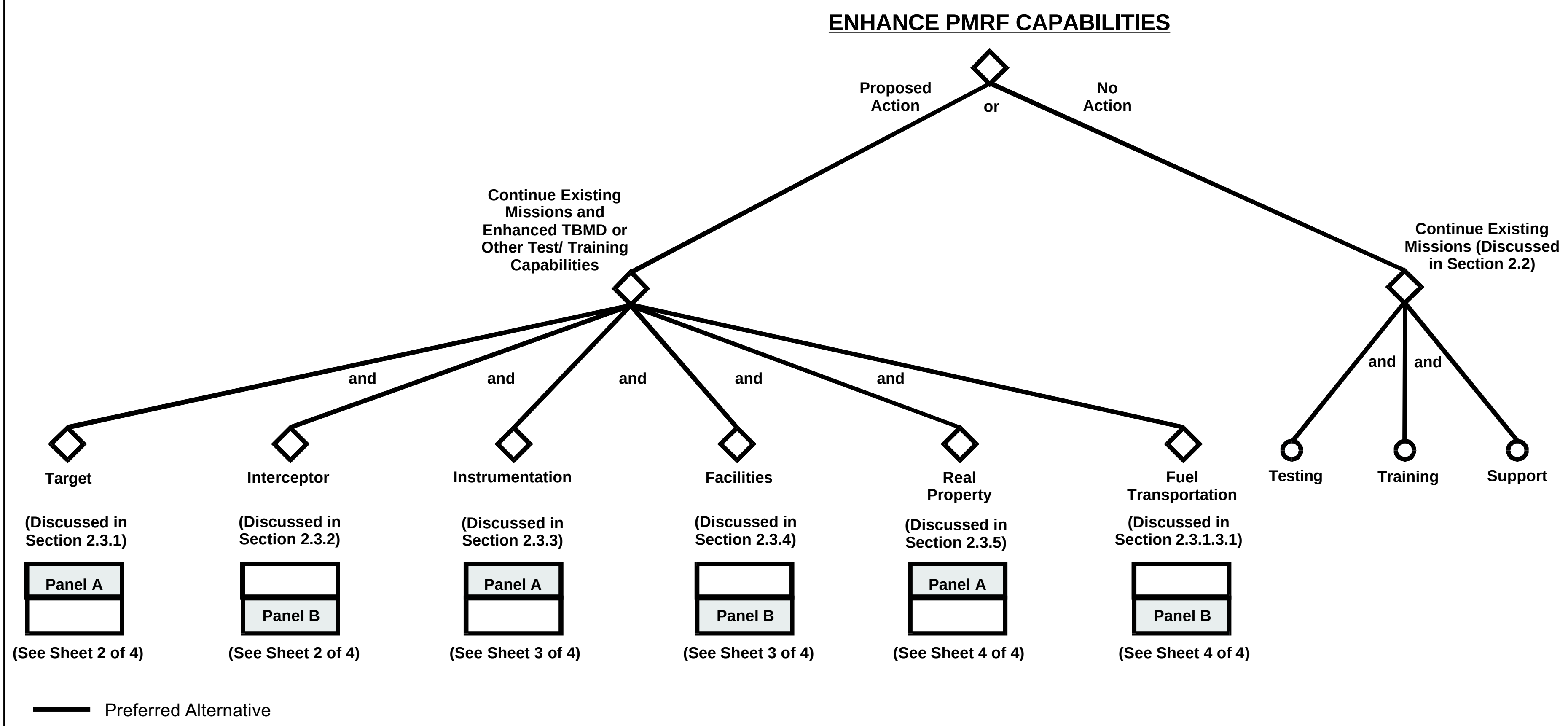

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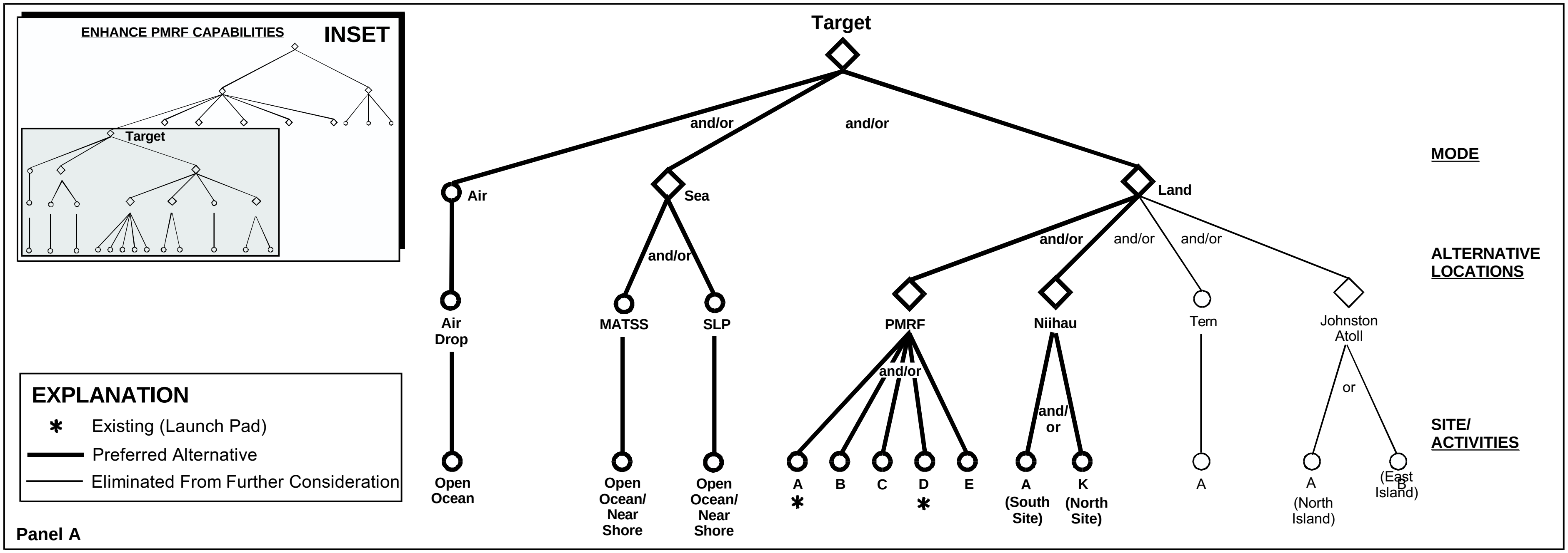
Figure 1.4-1 (Sheet 2 of 4): Decisions by Activities (Added)



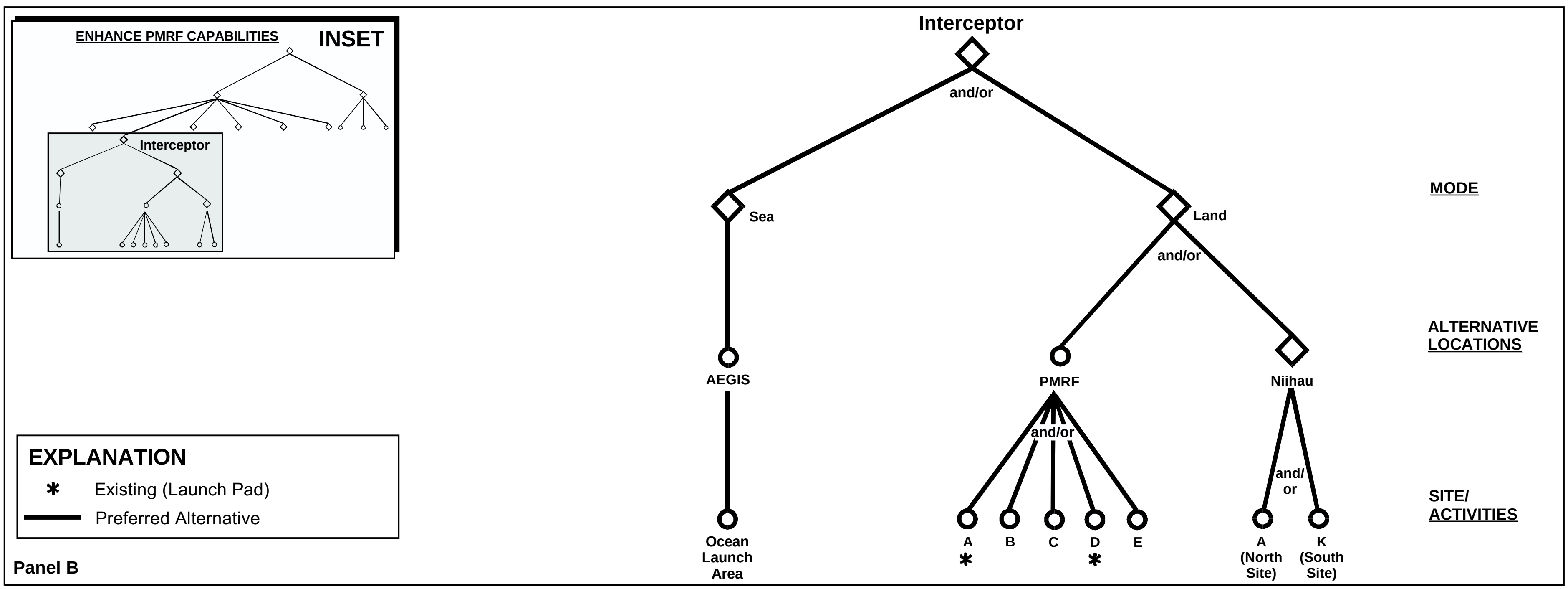


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Figure 1.4-1 (Sheet 3 of 4): Decisions by Activities (Added)

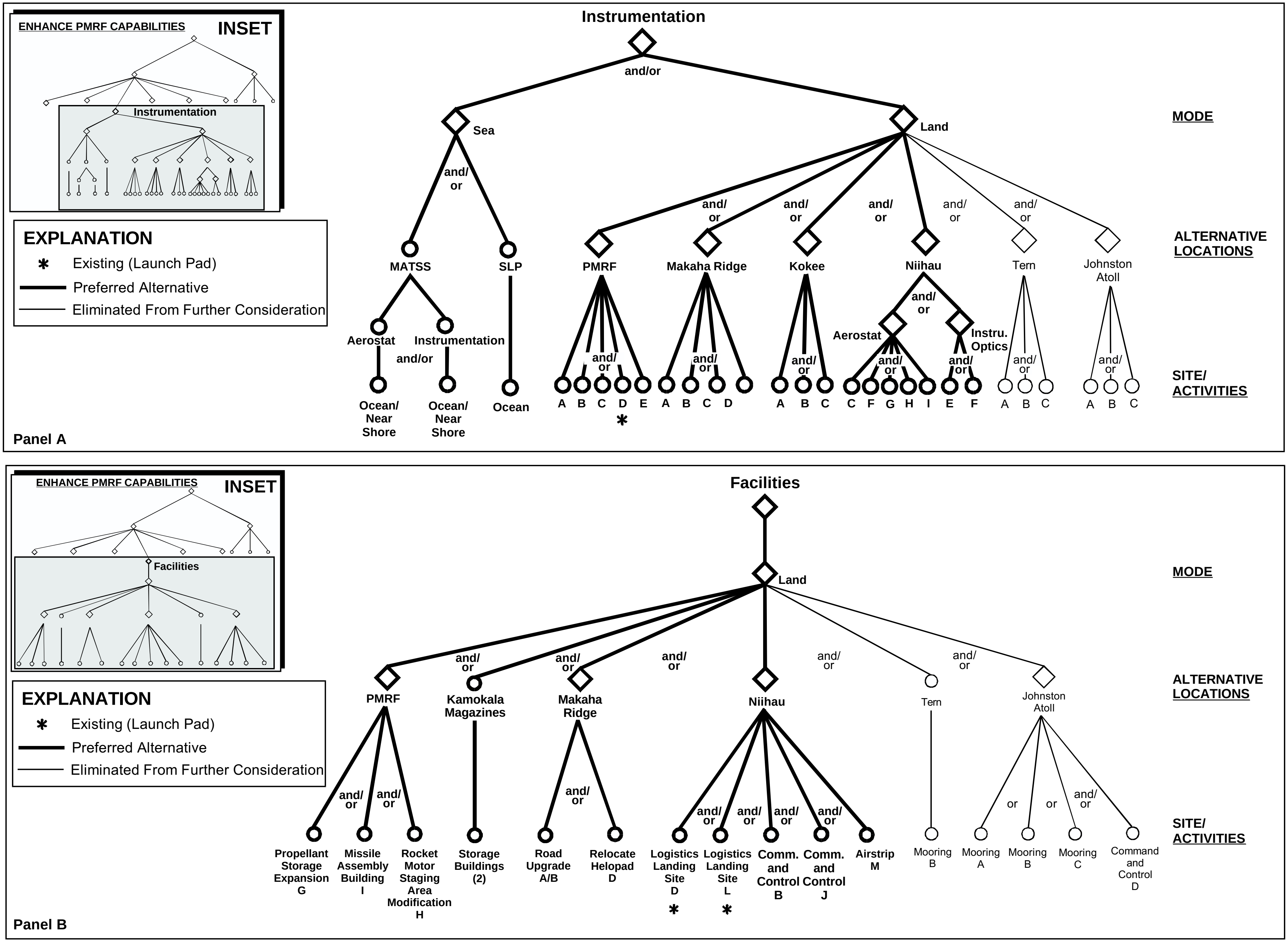

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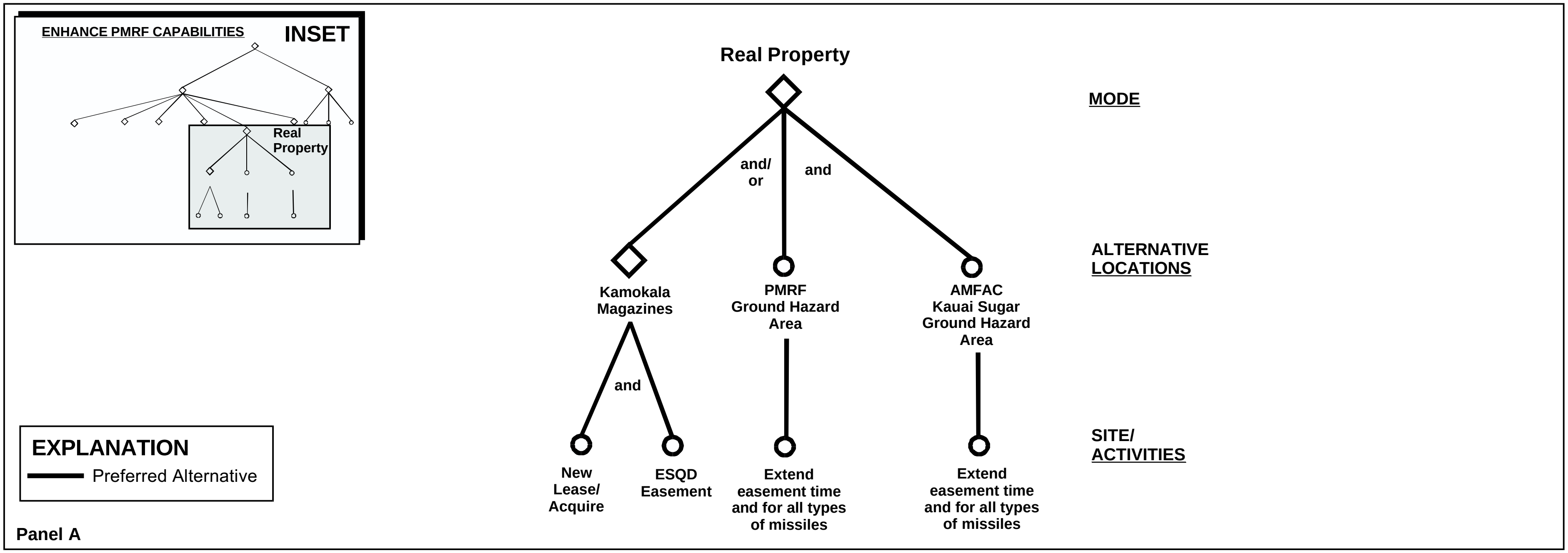
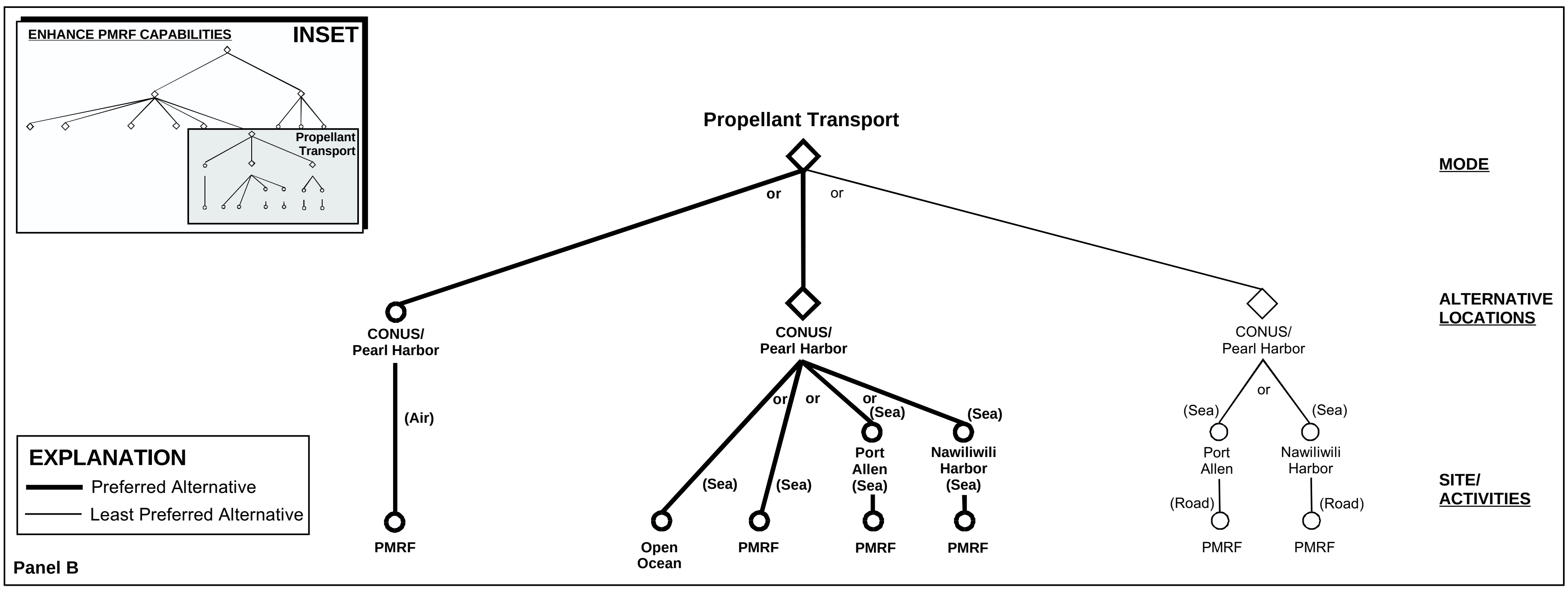
Figure 1.4-1 (Sheet 4 of 4): Decisions by Activities (Added)





Propellant transportation capabilities could be provided fom Pearl Harbor by air to PMRF, if appropriate waivers can be obtained. If these waivers cannot be obtained, then propellant transportation would be by sea. Propellants used for MATSS- or SLP-based launches would be loaded on those vessels at Pearl Harbor. Propellants used for PMRF-based launches would be either barged directly to PMRF from Pearl Harbor or, would be barged from Pearl Harbor to Port Allen or Nawiliwili Harbor, where they would be transferred to smaller vessels and shipped to PMRF.

1.5 SCOPE OF THIS ENVIRONMENTAL IMPACT STATEMENT

This EIS evaluates the potential environmental effects of the No-action Alternative and proposed enhancement of test and training capabilities of PMRF, including additional launch, instrumentation, and support sites and various levels of testing and training intensities under the Proposed Action. The EIS identifies and addresses potential environmental impacts at PMRF sites in the Pacific. Impacts could result from construction requirements at launch and other support locations, sensor test preparations, launch preparation, missile flight tests, and intercept tests. The EIS also analyzes the potential impacts of revising the existing easement with the State of Hawaii for land ad acent to PMRF for an additional 28-year period as well as other potential land use agreements, to provide for buffer zones ad acent to PMRF and an off-site ordnance storage facility for 31 years.

The EIS addresses all of the measurably foreseeable activities in the particular geographical areas affected by the No-action Alternative and Proposed Action and focuses on the activities ripe for Navy TBMD, TMD, and other related DOD decisions. While the ma ority of activities would use existing facilities and/or be on previously disturbed land, some activities may not. As the program evolves (e.g., Theater-Wide, discussed in section 2.3) and more site specification is available, the impact analysis will be reevaluated and, if necessary, additional environmental analyses conducted.

Because the Proposed Action requires decisions by the State of Hawaii, this EIS also assesses the environmental consequences of the Proposed Action in accordance with Hawaii law. The EIS addresses both Federal and State requirements and provides necessary analyses to allow agencies at all levels to consider the environmental effects of their decisions ~~fully~~.

Consistent with CEQ regulations, the scope of the analysis presented in this EIS was defined by the range of potential environmental impacts that would result from implementation of the No-action Alternative and Proposed Action. Resources that have a potential for impacts were considered in the EIS analysis to provide the decisionmakers with sufficient evidence and analysis for evaluation of the potential effects of the action. For this EIS, the environment is discussed in terms of 1 resource areas. Each resource area is discussed at each location addressed in this EIS proportionate to the potential for environmental impacts. Appendix D provides the rationale for not addressing all environmental resources at each specific location.

Figure 1. -1 shows the relationship between this EIS and other existing TMD or missile defense environmental impact analyses, and is also structured to illustrate the tiering relationship of these analyses. A number of alternatives for TMD testing were analyzed in the U.S. Army Space and Strategic Defense Command s *TMD Extended Test Range EIS*. Figure 1. -2 shows the relationship between this ~~D~~EIS and other existing PMRF documentation. This documentation is for both BMDO strategic programs and the Navy s range support documents at PMRF.

1.5.1 RELATED ENVIRONMENTAL DOCUMENTATION

TMD-Related Documents

1. U.S. Army Strategic Defense Command, 1 8 . *Final Environmental Impact Statement-Proposed Actions at U.S. Army Kwajalein Atoll*, October.

2. U.S. Department of the Navy, 1 1. *Environmental Assessment for the Standard Missile*, February.

3. U.S. Army Strategic Defense Command, 1 1. *Extended Range Intercept Technology (ERINT) Environmental Assessment*, September.

. U.S. Army Strategic Defense Command, 1 2. *Theater Missile Defense Countermeasures Mitigation Program Environmental Assessment*, September.

. U.S. Army Program Executive Office Missile Defense, 1 3. *Ground Based Radar (GBR) Family of Strategic and Theater Radars Environmental Assessment*, June.

. U.S. Army Space and Strategic Defense Command, 1 3. *Programmatic Environmental Assessment, Theater Missile Defense Lethality Program*, August.

. Ballistic Missile Defense Organization, 1 3 *Final Theater Missile Defense Programmatic Life-Cycle Environmental Impact Statement*, September.

a. Ballistic Missile Defense Organization, 1 8. *Air Drop Target System Program Programmatic Environmental Assessment*, May.

8. U.S. Department of the Navy, 1 3. *Environmental Assessment, Mountaintop Sensor Integration and Test Program*, December.

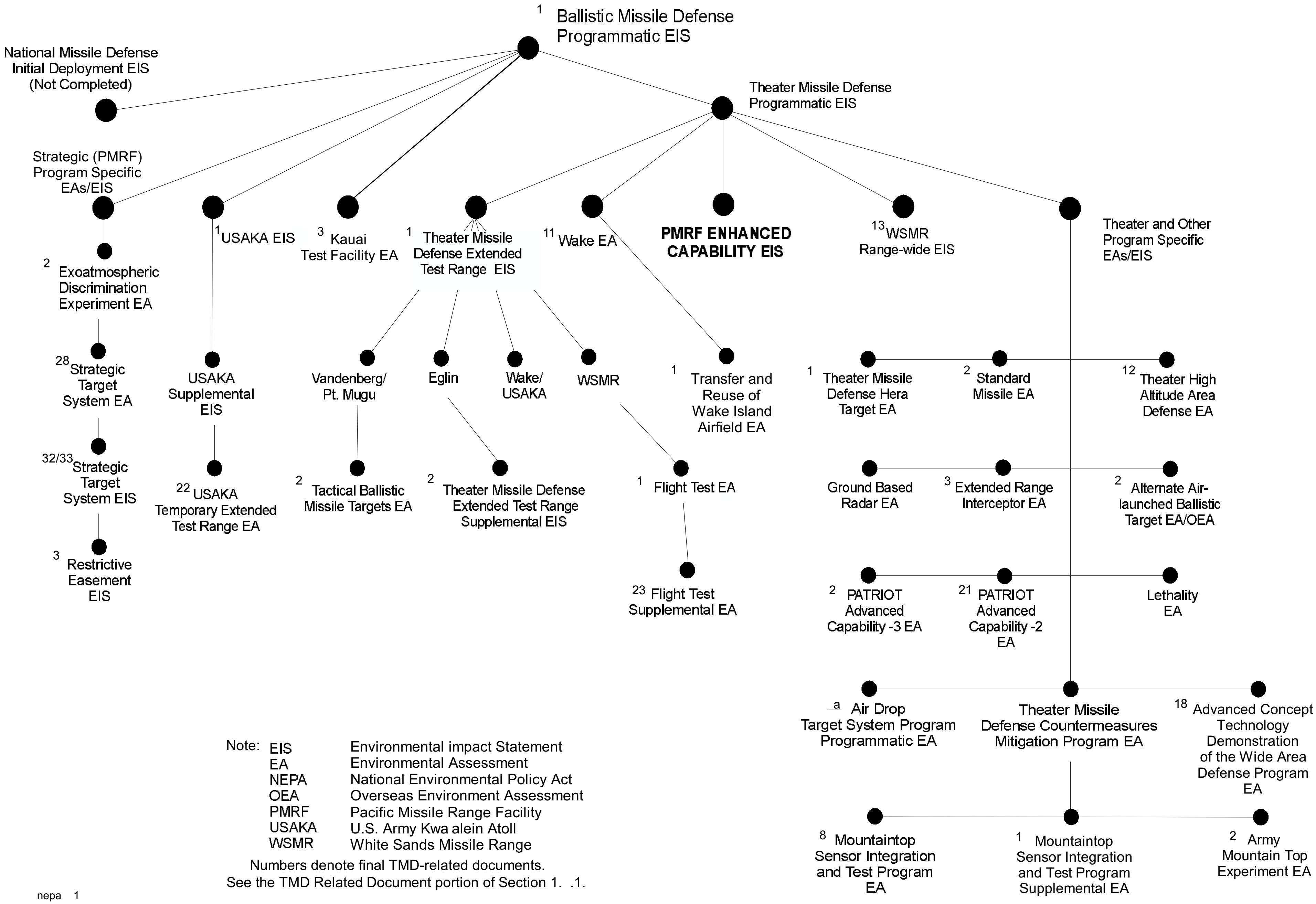
. U.S. Army Space and Strategic Defense Command, 1 3. *Final Supplemental Environmental Impact Statement for Proposed Actions at U.S. Army Kwajalein Atoll*, December.

1 . U.S. Army Space and Strategic Defense Command, 1 . Theater Missile Defense Hera Target Systems Environmental Assessment, January.

11. U.S. Army Space and Strategic Defense Command, 1 . Wake Island Environmental Assessment, January.

12. U.S. Army Space and Strategic Defense Command, 1 . Theater High Altitude Area Defense (THAAD) Initial Development Program Environmental Assessment, March.

Figure 1.5-1 Relationship of PMRF Enhanced Capability EIS with Other Missile Defense NEPA Documents (Revised)



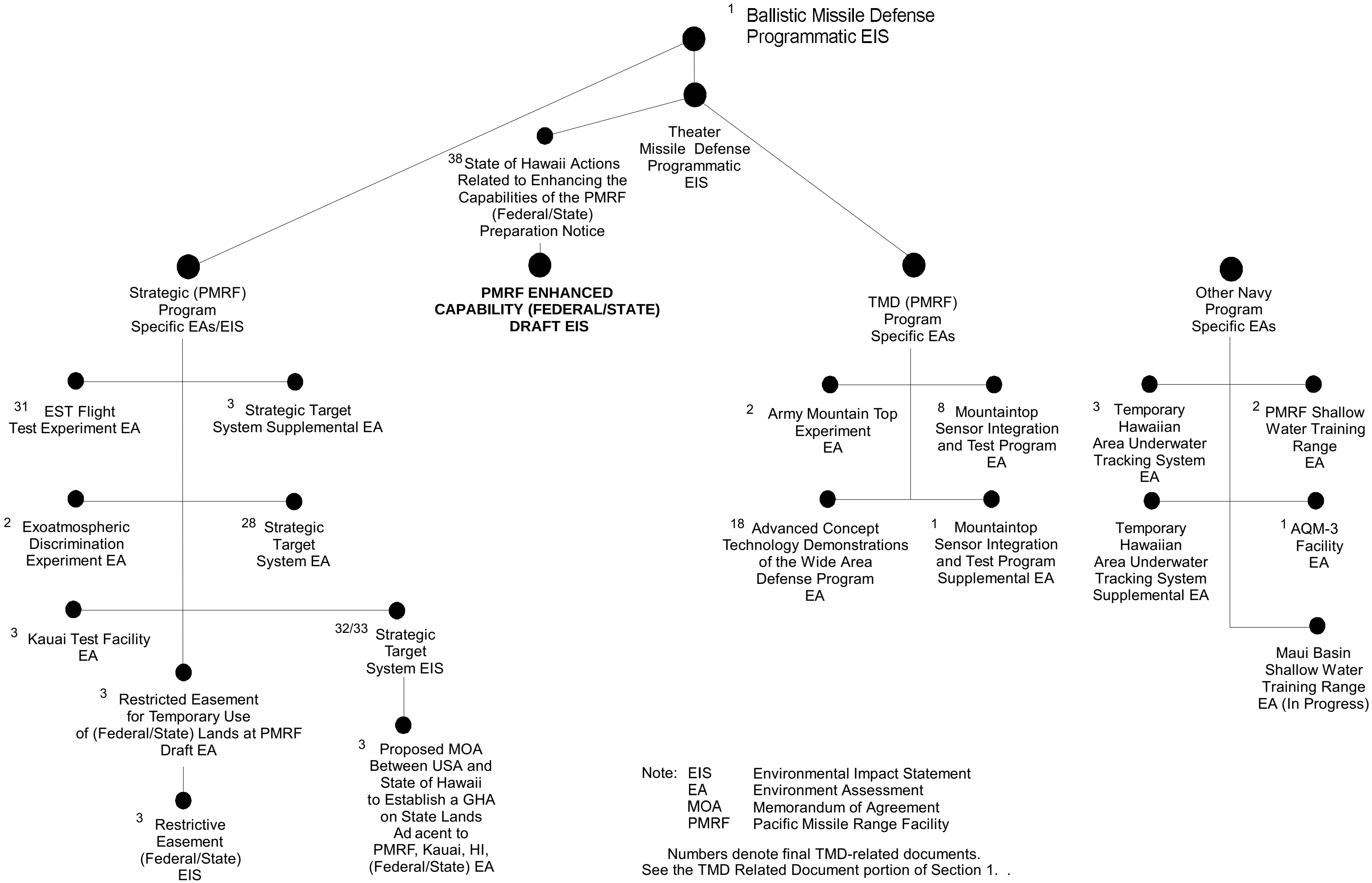
Note:

EIS	Environmental impact Statement
EA	Environmental Assessment
NEPA	National Environmental Policy Act
OEA	Overseas Environment Assessment
PMRF	Pacific Missile Range Facility
USAKA	U.S. Army Kwa alein Atoll
WSMR	White Sands Missile Range

Numbers denote final TMD-related documents.
See the TMD Related Document portion of Section 1. .1.

nepa 1

Figure 1.5-2 Relationship of PMRF Enhanced Capability EIS with Other PMRF/State of Hawaii Documents



13. White Sands Missile Range, ~~1~~1 8. Final White Sands Missile Range Range-wide ~~Draft~~ Environmental Impact Statement, ~~June~~January.

1 . U.S. Department of the Air Force, 1 . Transfer and Reuse of Wake Island Airfield Environmental Assessment, August.

1 . Ballistic Missile Defense Organization, 1 . Ballistic Missile Defense Final Programmatic Environmental Impact Statement, October.

1 . U.S. Army Space and Strategic Defense Command, 1 . Theater Missile Defense Extended Test Range Final Environmental Impact Statement, November.

1 . U.S. Department of the Navy, 1 . Supplemental Environmental Assessment, Mountaintop Sensor Integration and Test Program, March.

18. U.S. Department of the Navy, 1 . Environmental Assessment, Advanced Concept Technology, Demonstration of the Wide Area Defense Program, Kauai, Hawaii, April.

1 . U.S. Army Space and Strategic Defense Command, 1 . *Theater Missile Defense (TMD) Flight Test Environmental Assessment*, April.

2 . U.S. Army Space and Strategic Defense Command, 1 . Army Mountain Top Experiment Environmental Assessment, May.

21. U.S. Department of the Army, 1 . Environmental Assessment for the PATRIOT Missile System, June.

22. U.S. Army Space and Strategic Defense Command, 1 . U.S. Army Kwa alein Atoll Temporary Extended Test Range Environmental Assessment, October.

23. U.S. Army Space and Strategic Defense Command, 1 . Theater Missile Defense (TMD) Flight Test Supplemental Environmental Assessment, November.

2 . U.S. Department of the Navy, 1 . Alternate Air Launched Ballistic Target Environmental Assessment, December.

2 . U.S. Army Space and Strategic Defense Command, 1 . Patriot Advanced Capability-3 (PAC-3) Life Cycle Environmental Assessment, May.

2 . U.S. Department of the Air Force, 1 . *Theater Ballistic Missile Targets Programmatic Environmental Assessment*, Vandenberg Air Force Base, California, December.

2 . U.S. Department of the Air Force, 1 8. *Theater Missile Defense Extended Test Range Final Supplemental Environmental Impact Statement–Eglin Gulf Test Range*, Air Force Development Test Center, June.

PMRF Support and Related Documents

28. U.S. Army Strategic Defense Command, 1 . Strategic Target System (STARS) Environmental Assessment, July.

2 . U.S. Army Strategic Defense Command, 1 . Exoatmospheric Discrimination Experiment (ED) Environmental Assessment, September.

3 . U.S. Army Strategic Defense Command, 1 1. *Final Supplement to the Strategic Target System (STARS) Environmental Assessment*, July.

31. Strategic Defense Initiative Organization, 1 1. *ZEST Flight Test Experiment, Kauai Test Facility, Hawaii*, July.

32. U.S. Army Strategic Defense Command, 1 2. *Draft Environmental Impact Statement for the Strategic Target System*, February.

33. U.S. Army Strategic Defense Command, 1 2. *Final Environmental Impact Statement for the Strategic Target System, Volumes I through III*, May.

3 . U.S. Department of Energy, 1 2. *Kauai Test Facility (KTF) Environmental Assessment*, July.

3 . U.S. Army Strategic Defense Command, State of Hawaii Department of Land and Natural Resources, 1 2. *Final Environmental Assessment for Proposed Memorandum of Agreement Between the United States Government and the State of Hawaii to Establish a Ground Hazard Area on State Lands Adjacent to the Pacific Missile Range Facility, Kauai, Hawaii*, December.

3 . U.S. Army Space and Strategic Defense Command, State of Hawaii Department of Land and Natural Resources, 1 3. *Draft Environmental Assessment for Restricted Easement for Temporary Use of State Lands for Safety and Ground Hazard Areas for Strategic Target System and Navy Vandal Missile Launches from Kauai Test Facility at the United States Navy Pacific Missile Range Facility, Barking Sands, Kauai*, June.

3 . U.S. Army Space and Strategic Defense Command, 1 3. *Final Environmental Impact Statement for the Restrictive Easement Kauai, Hawaii*, October.

38. Pacific Missile Range Facility, State of Hawaii Department of Land and Natural Resources, 1 . *Preparation Notice for State of Hawaii Actions Related to Enhancing the Capabilities of the Pacific Missile Range Facility*, May.

Other Navy Hawaii Support Documents

3 . U.S. Department of the Navy, Pacific Missile Range Facility, 1 . *Final Assessment for a Temporary Hawaiian Area Underwater Tracking System*, June.

. U.S. Department of the Navy, Pacific Missile Range Facility, 1 . *Supplemental Environmental Assessment for a Temporary Hawaiian Area Underwater Tracking System (HATS)*, March.

1. U.S. Department of the Navy, Pacific Missile Range Facility, 1 . *AQM-37 Facility Environmental Assessment*, February.

2. U.S. Department of the Navy, Pacific Missile Range Facility, 1 . *PMRF Shallow Water Training Range Environmental Assessment,* April.

1.6 SUMMARY OF THE SCOPING PROCESS

The scoping process identifies the significant environmental issues relevant to the No-action Alternative and the Proposed Action, and provides an opportunity for public involvement in the development of the EIS. The Notice of Intent (NOI) and State of Hawaii EIS Preparation Notice were published in both the Federal Register and the Hawaii Office of Environmental Quality Control (OEQC) Bulletin on 23 May 1 (see appendix B). Notification of public scoping was also made through local media, as well as through letters to Federal, State, and local agencies and officials, and interested groups and individuals.

Four public scoping meetings were held in Hawaii from 1 23 June 1 . Table 1. -1 lists the locations, dates, and number of attendees at the meetings. An information meeting was also held with the residents of Niihau on 2 June 1 .

Table 1.6-1: Meeting Locations, Dates, and Times During the Scoping Process

Meeting Location	Date	Times	Public Attendees (sign-ins)
Waimea, Kauai, Waimea Neighborhood Center	1 June 1	: 8: p.m.	1
Kilauea, Kauai, Kilauea Neighborhood Center	1 June 1	: 8: p.m.	
Lihue, Kauai, Wilcox Elementary School Cafeteria	21 June 1	1: : p.m.	38
Honolulu, Oahu, Assembly Hall Fort Shafter Flats U.S. Army Reserve Center	23 June 1	: 8: p.m.	1
Niihau	2 June 1	: 11: a.m.	

Traditions of Niihau residents were respected during comment collection no public sign-in sheet was required, and the number of attendees is estimated.

At the registration table at each public scoping meeting, handouts were available which provided information on how to be heard, how to get more information, sheets for submitting written comments, and fact sheets on specific topics. The sheets provided descriptions of the EIS process, the coordination process and cooperating agencies, socioeconomics, missile propellants, biological resources, threatened and endangered species, wildlife refuges, existing PMRF safety measures, the existing operations of PMRF, land use at PMRF, the Proposed Action, TMD and TBMD, and the AEGIS Combat System. Attendees were offered an opportunity to add their names to a mailing list to receive a copy of this EIS.

After registration, attendees were invited to view a video tape describing the existing operations at PMRF and the need for the Navy s TBMD program. Exhibit areas visually depicted the EIS process, existing operations at PMRF, biological and cultural resources at PMRF, and the Proposed Action. At each area, staff specialists were present and, with each person who attended, informally discussed the exhibit, answered questions, provided a handout and offered additional information, and assisted in finding answers from other specialists present. The format allowed one-to-one communication and informal face-to-face exchanges between people.

On Niihau, a privately-owned island, a similar but modified approach was utilized, addressing issues of particular interest to residents of Niihau, such as socioeconomic information. Navy staff presented a depiction of a ground-based interceptor system and provided descriptions of the overall TBMD program, resource areas to be evaluated in the DEIS, the EIS schedule, and the reasons for the scoping process. Following the presentations, residents and staff engaged in an informal discussion.

1.7 SUMMARY OF CONSULTATION AND REVIEW PROCESS

The *PMRF Enhanced Capability Draft EIS* public comment period began on 8 April 1 8 when a notice was published in the Office of Environmental Quality Control s bulletin. On 1 April 1 8, the Notice of Availability was published in the *Federal Register* (see appendix B). Concurrently, the Draft EIS was mailed to all those who had requested a copy, and letters responding to scoping comments were mailed. This initiated a -day review period during which the public and interested agencies or organizations had the opportunity to review the Draft EIS and submit their written comments. These comments to the EIS were considered in the preparation of the Final EIS. Chapter . of this EIS contains a reproduction of substantive comments and responses made during the consultation process and Draft EIS review process.

In addition to the Draft EIS review process, two public hearings in Waimea, Kauai and Honolulu, Oahu were held on 2 and 28 April, respectively. Chapter 8. of this EIS contains a reproduction of the transcripts of the hearings and responses to the comments. In addition, an information meeting was also held with the residents of Niihau on 23 April 1 8. Comments received during these meetings were considered in preparation of this EIS. Table 1. -1 lists the locations, dates, and number of attendees at the meetings on Niihau, Kauai, and Oahu.

Table 1.7-1: Meeting Locations, Dates, and Times During the Draft EIS Comment Period

Meeting Location	Date	Time	Public Attendees (sign-ins)
Niihau	23 April 1 8	: -11: p.m.	__
Waimea, Kauai, Waimea United Church of Christ Education Center	2 April 1 8	1 : a.m.- : p.m.	3 3
Honolulu, Oahu, Disabled American Veterans Hall	28 April 1 8	: - : p.m.	8

Traditions of Niihau residents were respected during comment collection no public sign-in sheet was required.

Ref. No.	Reference	Page #	¶	Line
130	U.S. Army Space and Strategic Defense Command, 1993. *Final Environmental Impact Statement for the Restrictive Easement, Kauai, Hawaii*, October. (Figure 2.2.1-1)	2-3		
148	U.S. Department of Defense, 1991. *Range User's Handbook*, Department of the Navy, Pacific Missile Range Facility Hawaiian Area, Barking Sands, September. (Figure 2.2.1-2)	2-5		
221	Uyehara, S., 1996. Personal communication between Stephen M. Uyehara, Aerial Targets Manager, Range System Division, Pacific Missile Range Facility, and Quent Gillard, EDAW, Inc., regarding typical exercise aerial targets used at PMRF, 16 December. (Figure 2.2.1-3)	2-9		
85	Pacific Missile Range Facility, Barking Sands, Hawaii, 1997. *Shallow Water Training Range, Pacific Missile Range Facility, Barking Sands, Kauai, Hawaii: Environmental Assessment*, April.	2-14	3	9
148	U.S. Department of Defense, 1991. *Range User's Handbook*, Department of the Navy, Pacific Missile Range Facility Hawaiian Area, Barking Sands, September. (Figure 2.2.1-6)	2-15		
79	Pacific Missile Range Facility, 1994*. Final Environmental Assessment For a Temporary Hawaiian Underwater Tracking System,* 29 June. (Figure 2.2.1-7)	2-16		
132	U.S. Army Space and Strategic Defense Command, 1994. *Theater Missile Defense Extended Test Range Draft Environmental Impact Statement*, *Volume II*, January. (Figure 2.2.1-9)	2-19		
176	U.S. Navy Pacific Missile Range Facility, Kekaha, Hawaii, 1997. *96752: Site Manual*, March.	2-22	1	6
176	U.S. Navy Pacific Missile Range Facility, Kekaha, Hawaii, 1997. *96752: Site Manual*,	2-22	2	5

Ref. No.	Reference	Page #	¶	Line
	March.			
84	Pacific Missile Range Facility, Barking Sands, Hawaii, 1991. *Fleet Mission Planning Guide, FMPG-91*, 1 April.	2-23	6	5
179	Valencia, Sr., R., 1996. Personal communication between Robert Valencia, Sr., Range Programs Division Head, Range Programs Division, Pacific Missile Range Facility, and Quent Gillard, EDAW, Inc., 10 December.	2-27	2	12
115	Tasaka, D., 1998. Personal communication between Dennis Tasaka, Program Analyst, Pacific Missile Range Facility and Edd Joy, EDAW, Inc., 21 January.	2-27	2	12
116	Tasaka, D., 1998. Personal communication between Dennis Tasaka, Program Analyst, Pacific Missile Range Facility, and Edd Joy, EDAW, Inc., regarding targets used, 26 January—Mistake, should be #115.	2-27	2	12
80	Pacific Missile Range Facility, 1995. *Pacific Missile Range Facility Site Manual*, 14 November. (Figure 2.2.2-1)	2-29		
81	Pacific Missile Range Facility, 1996. *Hazardous Waste Management Plan,* October.	2-36	4	6
203	Nitta, G., and R. Hommons, 1998. Comments provided by Gene Nitta, Protected Species Program Manager, Pacific Islands Area office, National Marine Fisheries Service, and Rebecca Hommons, Counsel, COMNAVBASE Pearl Harbor, regarding the *Draft Pacific Missile Range Facility Enhanced Capability Environmental Impact Statement* (3 April 1998), 9 June.	2-37	1	1
90	Poetter, R., 1998. Personal communication between Rick Poetter, PRINWRC Refuge Manager, U.S. Fish and Wildlife Service, and EDAW, Inc., regarding U.S. Fish and Wildlife Service and National Marine Fisheries Service activities on Tern Island, 5 February.	2-37	3	12

Ref. No.	Reference	Page #	¶	Line
90	Poetter, R., 1998. Personal communication between Rick Poetter, PRINWRC Refuge Manager, U.S. Fish and Wildlife Service, and EDAW, Inc., regarding U.S. Fish and Wildlife Service and National Marine Fisheries Service activities on Tern Island, 5 February.	2-37	4	8
90	Poetter, R., 1998. Personal communication between Rick Poetter, PRINWRC Refuge Manager, U.S. Fish and Wildlife Service, and EDAW, Inc., regarding U.S. Fish and Wildlife Service and National Marine Fisheries Service activities on Tern Island, 5 February.	2-38	1	2
156	U.S. Department of the Army, 1990. *Final Second Supplemental Environmental Impact Statement, Johnston Atoll Chemical Agent Disposal System (JCADS) Storage and Ultimate Disposal of the European Chemical Munitions Stockpile,* June.	2-38	2	18
92	Poetter, R., 1998. Personal communication between Rick Poetter, PRINWRC Refuge Manager, U.S. Fish and Wildlife Service, and EDAW, Inc., regarding human activities on Johnston Atoll, 6 February.	2-38	4	13
5	Ballistic Missile Defense Organization, 1996. *BMDO Fact Sheet 96-001: U.S. Ballistic Missile Defense Program Focus*, March.	2-39	6	4
5	Ballistic Missile Defense Organization, 1996. *BMDO Fact Sheet 96-001: U.S. Ballistic Missile Defense Program Focus*, March. (Figure 2.3-1)	2-40		
50	Lawshe, J., 1996. Personal communication between James S. Lawshe, Senior Systems Engineer, High Technology Solutions, Inc., and Quent Gillard, EDAW, Inc., regarding comments on the 18 November 1996 DOPAA and including an enclosure of graphics, 10 December. (Figure 2.3-2)	2-42		
129	U.S. Army Space and Strategic Defense Command, 1993. *Programmatic Environmental Assessment Theater Missile*	2-46	5	12

Ref. No.	Reference	Page #	¶	Line
	Defense Lethality Program, August.			
50	Lawshe, J., 1996. Personal communication between James S. Lawshe, Senior Systems Engineer, High Technology Solutions, Inc., and Quent Gillard, EDAW, Inc., regarding comments on the 18 November 1996 DOPAA and including an enclosure of graphics, 10 December. (Figure 2.3.1-2)	2-50		
132	U.S. Army Space and Strategic Defense Command, 1994. *Theater Missile Defense Extended Test Range Draft Environmental Impact Statement*, *Volume II*, January.	2-51	1	2
28	Gonzalez, R., 1997. Personal communication between Richard Gonzalez, U.S. Army Space and Strategic Defense Command, and Quent Gillard, EDAW, Inc., regarding the sea launch platform, 23 July.	2-51	1	5
28	Gonzalez, R., 1997. Personal communication between Richard Gonzalez, U.S. Army Space and Strategic Defense Command, and Quent Gillard, EDAW, Inc., regarding the sea launch platform, 23 July.	2-51	2	7
5	Ballistic Missile Defense Organization, 1996. *BMDO Fact Sheet 96-001: U.S. Ballistic Missile Defense Program Focus*, March.	2-51	4	4
186	Ballistic Missile Defense Organization, 1998. *Programmatic Environmental Assessment Air Drop Target System Program,* May.	2-51	4	13
186	Ballistic Missile Defense Organization, 1998. *Programmatic Environmental Assessment Air Drop Target System Program,* May.	2-51	5	3
132	U.S. Army Space and Strategic Defense Command, 1994. *Theater Missile Defense Extended Test Range Draft Environmental Impact Statement*, *Volume II*, January. (Figure 2.3.1-4)	2-54		
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171	U.S. Department of the Navy, Theater Air Defense Program Executive Office, PEO(TAD)-B, 1996. *Draft Navy TBMD Program Range Upgrade Requirements,* 3 December.	2-59	2	9
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205	Pacific Missile Range Facility, 1993, 15 November (Figure 2.3.4-1)	2-63		
206	Pacific Missile Range Facility, 1996, January. (Figure 2.3.4-2)	2-64		
164	U.S. Department of the Navy, 1990. *Master Plan PACMISRANFAC HAWAREA, Barking Sands, Kauai, Hawaii,* Pacific Division, Naval Facilities Engineering Command, Facilities Planning Department, Pearl Harbor, Hawaii, October. (Figure 2.3.4-3)	2-65		
219	U.S. Department of the Navy, 1992. *Makaha Ridge, Kauai, General Development Map—Utilities, Main Station, Section One, Electrical Distribution System, Scale 1″ = 200′, Revised,* Naval Facilities Engineering Command, Pacific Missile Range Facility, Hawaiian Area, 1 March. (Figure 2.3.4-4)	2-67		
50	Lawshe, J., 1996. Personal communication between James S. Lawshe, Senior Systems Engineer, High Technology Solutions, Inc., and Quent Gillard, EDAW, Inc., regarding comments on the 18 November 1996 DOPAA and including an enclosure of graphics, 10	2-69		

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157	U.S. Department of the Interior, 1986. *Hawaiian Islands National Wildlife Refuge County of Honolulu Final Master Plan/Environmental Impact Statement, FES #86/11,* Fish and Wildlife Service, Region One, May. (Figure 2.3.4-7)	2-73		
159	U.S. Department of the Interior, 1993. *The Johnston Atoll Installation Restoration Program Management Action Plan*. (Figure 2.3.4-9)	2-76		
147	U.S. Department of Commerce and U.S. Department of Defense, 1993. *High and Low Altitude Pacific, Australasia and Antarctica: Radar Instrument Approach Minimum Standard Terminal Arrival Instrument Approach Procedures, Standard Instrument Departures,* Airport Diagram, 7 January.	2-86	2	10

2.0 Description of Proposed Action and Alternatives

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This section first describes the No-action Alternative, followed by the Proposed Action. The No-action Alternative is the continuation of (1) existing range and land-based training and operations, (2) existing RDT E activities, and (3) ongoing base operations and maintenance of the technical and logistical facilities that support the training and operations missions conducted at PMRF.

The Proposed Action assumes the continuation of existing activities at PMRF. It also combines these activities with (1) the upgrading of existing radar, telemetry, optics, electronic warfare, differential global positioning system (DGPS), and other instrumentation facilities, and (2) the construction and operation of additional missile launch sites, sensor and instrumentation facilities, and ordnance storage buildings that would enhance the capability of PMRF. The enhanced capability would include expanded telemetry coverage (for example, wide bandwidth recorders/receivers) and over-the-horizon coverage for range safety display capability over-the-horizon tracking of participants, weapons, and targets over-the horizon target launch capability, particularly on multiple target azimuths (or axes) into PMRF areas of operation and cooperative engagement capability that would link the data from shipboard sensors to land-based or airborne sensors in a composite fire-control network.

The Navy s Preferred Alternative, as described in section 1. , consists of all elements of the Proposed Action, but without consideration of the use of Tern Island and Johnston Atoll. Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in the EIS, however, in order to preserve the work that has already been performed.

Descriptions of the target launches associated with the Preferred Alternative are in section 2.3.1. The launches of interceptors as part of the Preferred Alternative are described in section 2.3.2. The upgrades to instrumentation and facilties as part of the Preferred Alternative are described in sections 2.3.3 and 2.3. , respectively. The modification of easements with the State of Hawaii is listed in section 2.3.1.3. . The Preferred Alternative for transporting liquid propellants is described in section 2.3.1.3.1.

Such enhanced capability would allow the RDT E of defensive missile interceptor technologies being developed for the Navy s TBMD program, and the training of personnel in the use of these systems when they are introduced into the fleet. The enhanced capability could also be used for similar systems and technologies being developed by other services for the overall DOD TMD program.

Section 2.2 describes the types of activities that would continue to occur at PMRF under the No-action Alternative. Section 2.3 describes the activities necessary to enhance the capability of PMRF, or the Proposed Action. Section 2. describes the alternatives eliminated from detailed study and why they were eliminated (e.g., exclusionary criteria). Section 2. compares the alternatives by summarizing their environmental consequences. The last section, 2. , identifies other concurrent programs to be evaluated for cumulative impacts. Detailed descriptions of facilities are provided in section 3, Affected Environment.

Under the Proposed Action, the existing lease of exclusive easement would be modified to address missile launches, which would require the use of State lands ad acent to PMRF as a ground hazard area and extension of the term of that easement from 1 January 2 3 to 3 December 2 3 . In addition, under the Proposed Action, the current lease of State lands at Kamokala Magazines, Kauai, which expires on 1 August 2 2 , would be modified to permit the Navy to construct facilities to store additional ordnance related to missile launch activities, and to acquire a restrictive easement to accommodate the associated ESQD arc which would also expire on 1 August 2 2 .

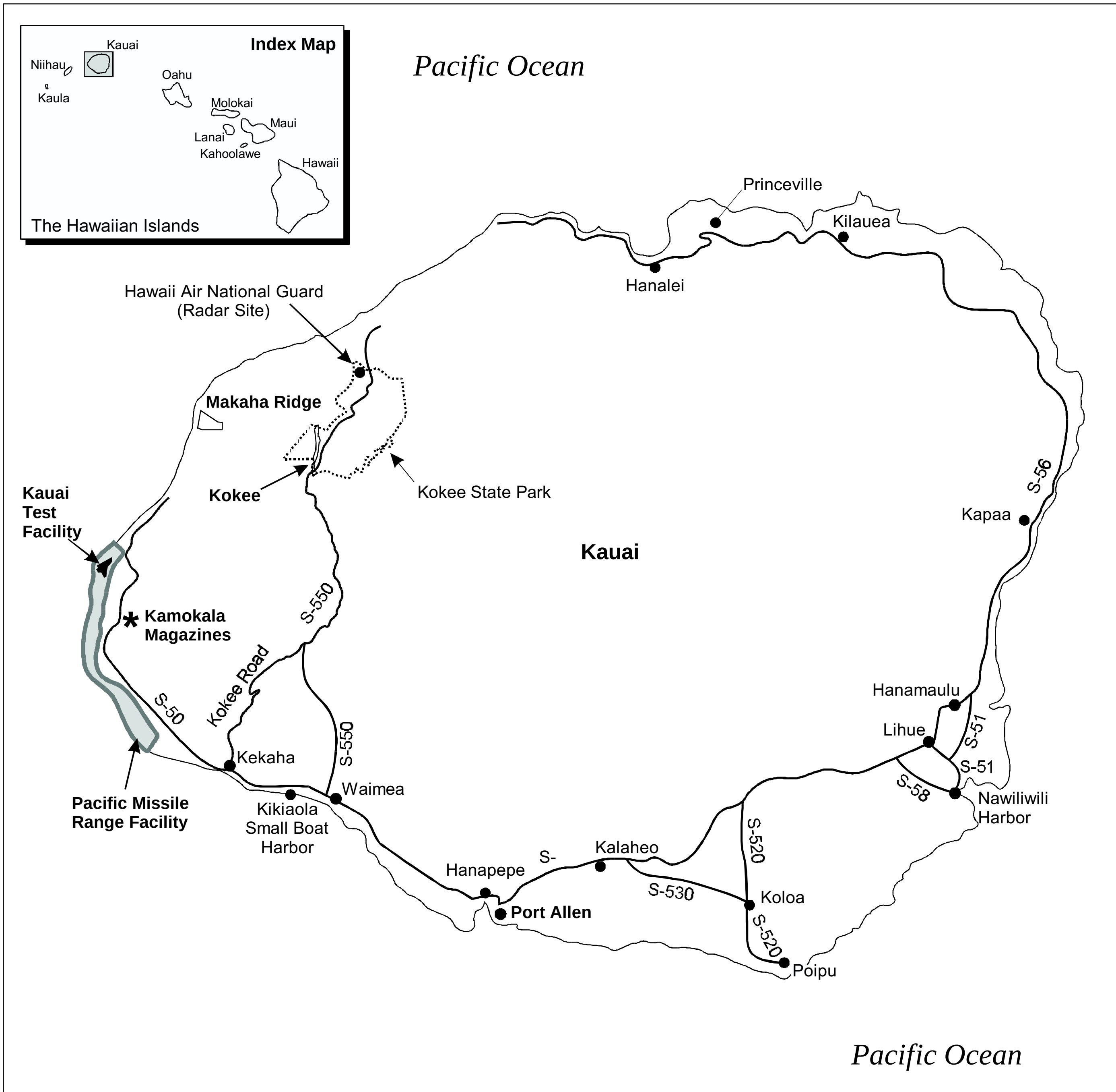
2.2 NO-ACTION ALTERNATIVE

The No-action Alternative is the continuation of PMRF s primary mission. PMRF would continue to operate the Underwater Tracking Range and surface and airspace operations areas in support of existing range and land-based training and operations. Ongoing operations and maintenance of the technical and logistical facilities that support training exercises and operations conducted at PMRF and PMRF s secondary mission of RDT E would also continue.

2.2.1 RANGE TRAINING AND OPERATIONS— NO-ACTION ALTERNATIVE

PMRF is the world s largest instrumented, multi-environment, military test range capable of supporting subsurface, surface, air, and space operations. PMRF consists of ~~2,~~ 3, 2 square kilometers (km^2) (1, square nautical miles nmi^2) of instrumented underwater ranges and ~~over 12 ,1~~ 1 , km^2 (2, nmi^2) of controlled airspace. PMRF provides ma or range services for training, tactics development, and evaluation of air, surface, and subsurface weapons systems for the Navy, other DOD agencies, foreign military forces, and private industry. It also maintains facilities and provides services to support naval operations, and other activities and units designated by the Chief of Naval Operations.

The PMRF range is located in Hawaii on and off the western shores of the Island of Kauai (figure 2.2.1-1) and includes broad ocean areas to the north, south, and west. The relative isolation of PMRF, an ideal year-round tropical climate, and a relatively open area are significant factors in PMRF s excellent record of completed operations.



Source: Modified from U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-2 .

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EXPLANATION

S- State Highway

.... Kokee State Park Boundary

Location of Pacific Missile Range Facility and Related Sites on Kauai

Kauai, Hawaii

Figure 2.2.1-1

Scale

.1 8.1 Kilometers

2. Miles

NORTH

naa kauai 1

PMRF facilities on the Island of Oahu provide range services to ships and aircraft operating in the areas off and in Pearl Harbor. Operations support services are also provided in other remote training areas in the Hawaiian chain. PMRF is also linked to other range and data-processing facilities and transmits real-time test and exercise data and video anywhere in the world.

2.2.1.1 Range Support Sites

Range support sites in the Hawaiian Islands are shown in figure 2.2.1-2 and described in the following paragraphs.

The PMRF/Main Base provides radar tracking and surveillance, global positioning system (GPS) data processing, the communication network, and command and control from the Range Operations Center. Airfield facilities in the PMRF/Main Base support up through C -type cargo aircraft, tactical aircraft, and helicopters, both U.S. and allied. PMRF/Main Base provides a target support and red-label (live ordnance) area, an ordnance and launching area, and a torpedo shop for torpedo operations and recovery.

The Makaha Ridge site provides radar tracking and surveillance, primary telemetry receiving and recorders, frequency monitoring, target control, and electronic warfare and networked operations. Kokee supports tracking radars, telemetry, communications, and command and control systems. Kamokala Magazines provides secure ordnance storage with ten ordnance magazines approved for Class 1.1 explosives.

PMRF s range support boats and Seaborne Powered Target (SEPTAR) boat operations and maintenance facilities are located at Port Allen, which provides pier space, protected anchorage, and small-boat launch facilities.

Under agreements between the Navy and the owner, the privately-owned Island of Niihau provides a remotely-operated PMRF surveillance radar, a Test Vehicle Recovery Site, an electronic warfare site, multiple electronic warfare portable simulator sites, a marker for aircraft mining exercise programs, and a helicopter terrain-following flight training course.

2.2.1.2 External Support Agencies

A variety of external agencies and locations shown in figure 2.2.1-2, and described in the following paragraphs, provide range support to range users, coordinated through the PMRF Program Manager. Naval Undersea Warfare Center (NUWC) maintains a facility that provides underwater target services, exercise reconstruction, and underwater pinger installation services. Activities at NUWC are discussed in section 2.2.2.11.3. Sandia National Laboratories (SNL) operates KTF for the DOE and, through inter-service support agreements, provides PMRF with rocket launch services for target systems and upper atmosphere measurements. Activities at KTF are discussed in section 2.2.2.11. .

The Air Force Maui Optical Station (AMOS), the Maui Optical Tracking and Identification Facility (MOTIF), and the Ground-based Electro-optical Deep Space Surveillance System (GEODSS), located at the Maui Space Surveillance System (MSSS) site atop Mount Haleakala, provide a unique vantage point for observing orbital and sub-orbital vehicles.

KAULA:
- Gunnery Exercises

NIIHAU:
- Surface Surveillance
- Electronic Warfare
- Optics

KAUAI:

BARKING SANDS:
- Air Surface Surveillance
- Launch Facilities
- Range Operations
- Target Facilities
- Missile Armory
- Torpedo Shop
- Radar Tracking
- Global Positioning System Tracking
- Radar and Telemetry Processing
- Flight Termination
- Communication Hub
- Radio Frequency Communications

MAKAHA RIDGE:
- Air Surface Surveillance
- Radar Tracking
- Telemetry Receiving
- Target Control
- Radio Frequency Communication
- Electronic Warfare

KOKEE:
- Radar Tracking
- Telemetry
- Global Positioning System Tracking
- Flight Termination
- Radio Frequency Communication

KAMOKALA MAGA INES:
- Ordnance Storage

MT. KAHILI:
- Radio Frequency Communication

PORT ALLEN:
- Range Boats
- Range Target Boats

OAHU:

KAENA POINT:
- Telemetry Receiving
- Radar Tracking

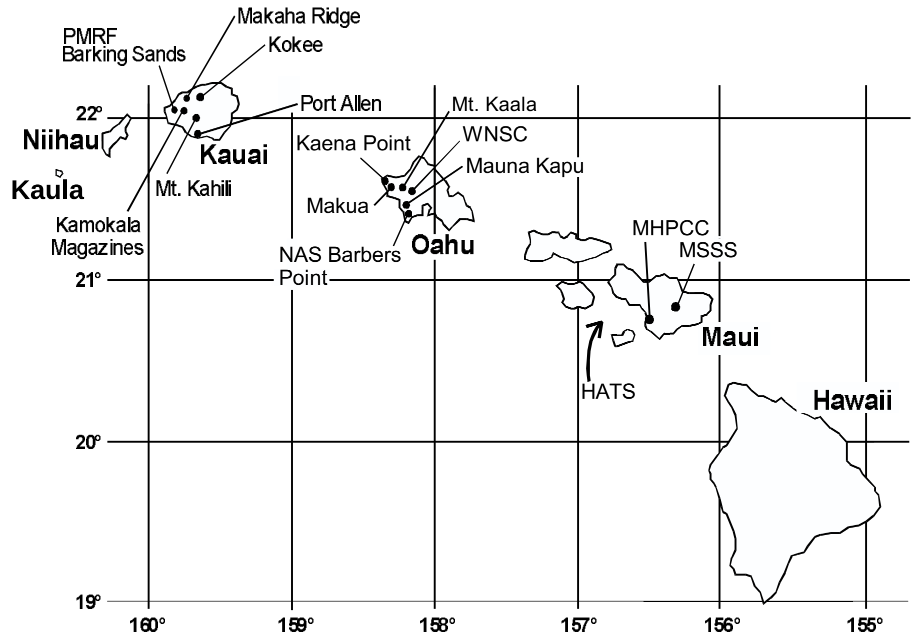
MT. KAALA:
- Radar Tracking
- Radio Frequency Communication

MAKUA:
- Radio Frequency Communication
- Repeater Station
- Cable Head

NAVAL AIR STATION BARBERS POINTS:
- Electronic Warfare

MAUNA KAPU:
- Electronic Warfare
- Radio Frequency Communication

WHEELER NETWORK SEGMENT CONTROL (WNSC)
- Ma or Communications Hub



MAUI:

HAWAIIAN AREA TRACKING S STEM (HATS) CONTROL CENTER
- Anti-Submarine Operations
- Research, Development, Test and Evaluation

MAUI HIGH PERFORMANCE COMPUTING CENTER (MHPCC)

MAUI SPACE SURVEILLANCE S STEM (MSSS)
- Optical Tracking
- Electro-Optical Surveillance
- Flight Termination
- Telemetry Receiving

Source: Modified from U.S. Department of Defense, 1 1, Sep, p.2.

EXPLANATION

PMRF Pacific Missile Range Facility
NAS Naval Air Station

Pacific Missile Range Facility and Related Support Locations (Revised)

NORTH

Scale
12 Kilometers
3 . Miles

Hawaiian Islands

Figure 2.2.1-2

The DOE Sandia Maui Haleakala Facility, linked to PMRF through leased circuits, provides telemetry receiving/recording, flight following high-altitude operations and command and control for high-altitude/exoatmospheric launches from PMRF.

The DOE also has agreements to occupy and use, as required, several other communication sites. These sites include MountKahili Repeater Station on Kauai and the MaunaKapu Communication Site on Oahu, both used as repeater stations for the KTF radio networks and Makua Radio/Repeater/Cable Head on Oahu, used for communications between PMRF and Johnston Island.

The Hawaii Air National Guard (HIANG) provides operations and maintenance of the Hawaii Digital Microwave System (HDMS), and a radar at the HIANG Kokee site. The Hawaii Tracking Station, located at Kaena Point, Oahu, provides real-time telemetry data to PMRF via PMRF microwave systems and the HDMS. The Air Force 3 th Range Squadron at Kaena Point provides tracking data from their radar through PMRF microwave systems and the HDMS. Wheeler Network Segment Control (WNSC) is a ma or communications hub utilized by PMRF. Voice and data signals are relayed via the HDMS and PMRF microwave and fiber optic systems to connect PMRF, Hawaii Tracking Station, and WNSC, and are further distributed to other military and commercial communications networks.

2.2.1.3 Range Safety and Range Control

2.2.1.3.1 Range Safety

The Navy takes every reasonable precaution during the execution of the operations, training exercises, and test and development activities described below to prevent in ury to human life and wildlife, or damage to property. Specific safety plans are developed to ensure that each hazardous operation is in compliance with applicable policy and regulations and to ensure that the general public and range personnel and assets are provided an acceptable level of safety.

Range safety at PMRF includes missile flight control, laser safety, ionizing radiation safety, and explosive and ordnance safety. Range users are required to provide specific information about their programs so that a safety analysis of all types of hazards can be completed and appropriate remedial procedures taken before initiation of hazardous activities.

For missile and weapons system tests, PMRF Safety establishes criteria for the safe execution of the test operation in the form of Range Safety Approval and Range Safety Operational Plan documents, which are required for all weapon and target systems using PMRF. These include allowable launch and flight conditions and flight control methods such as flight termination to contain the missile flight in the predetermined missile hazard space and missile impacts in the ground, launch, or terminal hazard areas, which have been determined clear of nonessential personnel, ships, and aircraft. The documents also describe the range safety system used to determine the missile location and flight status for range safety control. The range safety system consists of a control console, graphic displays, data processing computers, radar and telemetry instrumentation systems, command control transmitters, and communication systems. Chapter 3 describes PMRF range safety procedures in detail.

2.2.1.3.2 Range Control

Range Control is charged with hazard area surveillance and clearance and the control of all Range operational areas. The PMRF Range Control Officer is solely responsible for determining range status and setting RED (no firing) and GREEN (range is clear and support units are ready to begin the event) range firing conditions. The Range Control Officer coordinates the control of PMRF airspace with the Federal Aviation Administration (FAA) and other military users, often on a real-time basis.

The Range Control Officer communicates with the operations conductors and all participants entering and leaving the range areas. The Range Control Officer also communicates with other agencies such as the FAA Air Route Traffic Control Center (ARTCC) in Honolulu, the PMRF/Main Base airfield control tower, the 1 th Air Control Squadron at Kokee, and the Fleet Area Control and Surveillance Facility (FACSFAC) at Ford Island, Pearl Harbor.

2.2.1.3.2.1 Operational Areas

Two Warning Areas (W-18 and W-188) and one Restricted Area (R31 1) under the local control of PMRF are used for operations (see section 3.1.1.2, Airspace). The Warning Areas are in international waters and are not restricted however, the surface areas of the Warning Areas are listed as HOT (actively in use) 2   hours a day. For special operations, multi-participant, or hazardous weekend firings, PMRF publishes dedicated warning Notices to Mariners (NOTMARs) and Notices to Airmen (NOTAMs).

2.2.1.3.2.2 Operational Controls

Three user-operation control rooms at PMRF control air-to-air, air-to-surface, surface-to-air, surface-to-surface, undersea, and anti-submarine warfare operations. PMRF Operation Conductors are in direct communication with the respective participants throughout the operation.

2.2.1.3.2.3 Clearance of Restrictive Easement

Missile flight safety procedures require that the public and nonessential mission personnel be excluded from hazardous areas to protect them in the unlikely event of an early flight termination. The U.S. Government is required by DOD policy to be able to exclude nonparticipants from hazardous areas. The off-base portion of the respective ground hazard areas is located within a restrictive easement that was acquired from the State of Hawaii by the U.S. Government. The ground hazard area within the restrictive easement boundary is an arc of approximately 1,82 m (,   ft) for the U.S. Navy Vandal or a modified arc of approximately 3,   8 m (1 ,   ft) for the Strategic Target System. The modified arc is described such that the radius is approximately 3,   8m (1 ,   ft) to the northeast, approximately 2,   m (,1   ft) to the east, and approximately 2,   3 m (,   ft) to the south. The current restrictive easement agreement with the State of Hawaii expires on 31 December 2   2. Chapter 3 provides more details on the restrictive easement.

2.2.1.4 Fleet Training

Although task force elements routinely train simultaneously in all aspects of naval warfare, fleet operations and training conducted at the PMRF range are grouped into the following exercises: missile operations, air operations, gunnery, bombing, mining, electronic warfare, undersea warfare, submarine operations, and fleet training. These elements are described in the following sections. In addition, a description is provided of the underwater tracking operations conducted in support of the many range training exercises. Any ship, submarine, fixed-wing or rotary-wing aircraft in the U.S. and allied inventories may be used during fleet operations and training.

Fleet training exercises conducted at PMRF include both single ship and multi-unit events lasting about hours to 8 weeks. Training such as over-the-horizon targeting, weapons employment (guns, missiles, and torpedoes), and post overhaul trials are scheduled~~may combine some or all of the elements of other exercises identified below and usually address more than one threat simultaneously.~~ Table 2.2.1-1 has been moved to table A-1 in appendix A.~~describes each exercise or trial, and identifies the typical participants and duration of the exercise.~~

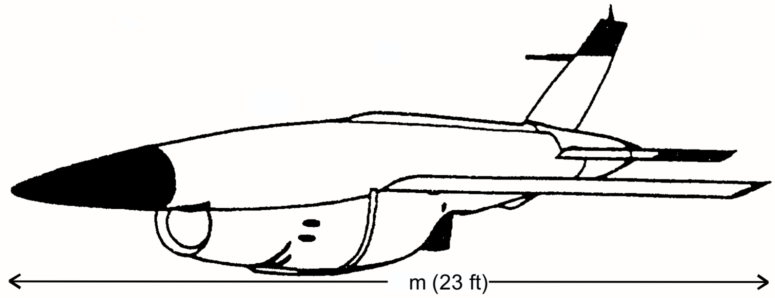
2.2.1.4.1 Missile Firings

Missile training exercises conducted at PMRF include general air-to-air, air-to-surface, surface-to-air, and surface-to-surface missile exercises specific anti-surface missile exercises and anti-air warfare exercises. Each missile training operation must obtain PMRF safety approval before proceeding, covering the type of weapon, type of target, speed, altitude, debris corridor, ground hazard area, and water surface and undersea hazard area. Table 2.2.1-2has been moved to table A-1 , appendix A.~~lists each missile exercise conducted at PMRF, including the identification of the typical participants and duration of the exercise.~~ Aerial targets are either launched from PMRF (discussed in section 2.2.1. .1) or launched from the~~Mobile Aerial Target Support System (~~MATSS~~)~~ in the open ocean. A list of missiles currently used, and their characteristics, is included in table A-1, appendix A. Typical aerial target drones and existing target systems are shown in figures 2.2.1-3 and 2.2.1- , and are included in tables A-2 and A-3 in appendix A, respectively.

2.2.1.4.2 Air Operations

Air Operations training at PMRF includes the air combat maneuver exercise (ACME). No weapons are expended and no target is launched. The ACME involves two or more fighter aircraft in air combat maneuvers, which provides the aircrews experience in flying in a close-combat environment. To accomplish this exercise at PMRF, each aircraft has a radar tracking beacon that allows precision tracking of the aircraft through various maneuvers. Participants typically include two to four aircraft. Duration of the exercise is usually minutes.

BQM-34S



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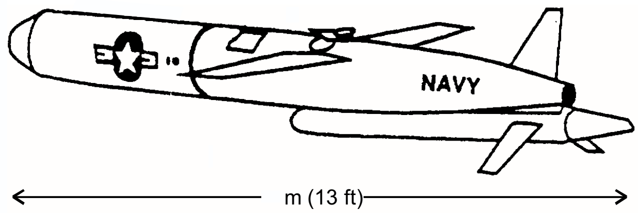

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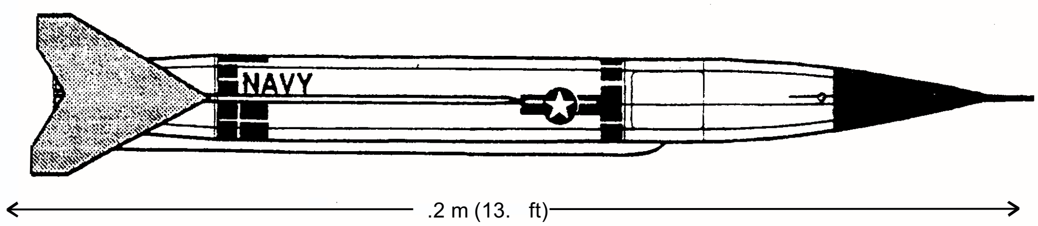
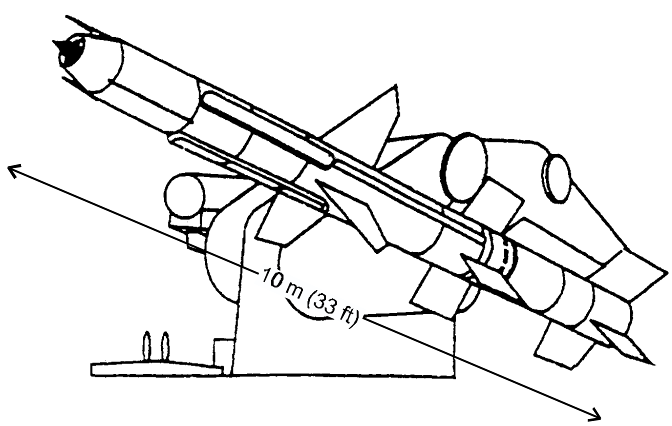


MQM-8G/ER Vandal



Source: Uyehara, 1   , 1   Dec, p.2-11.

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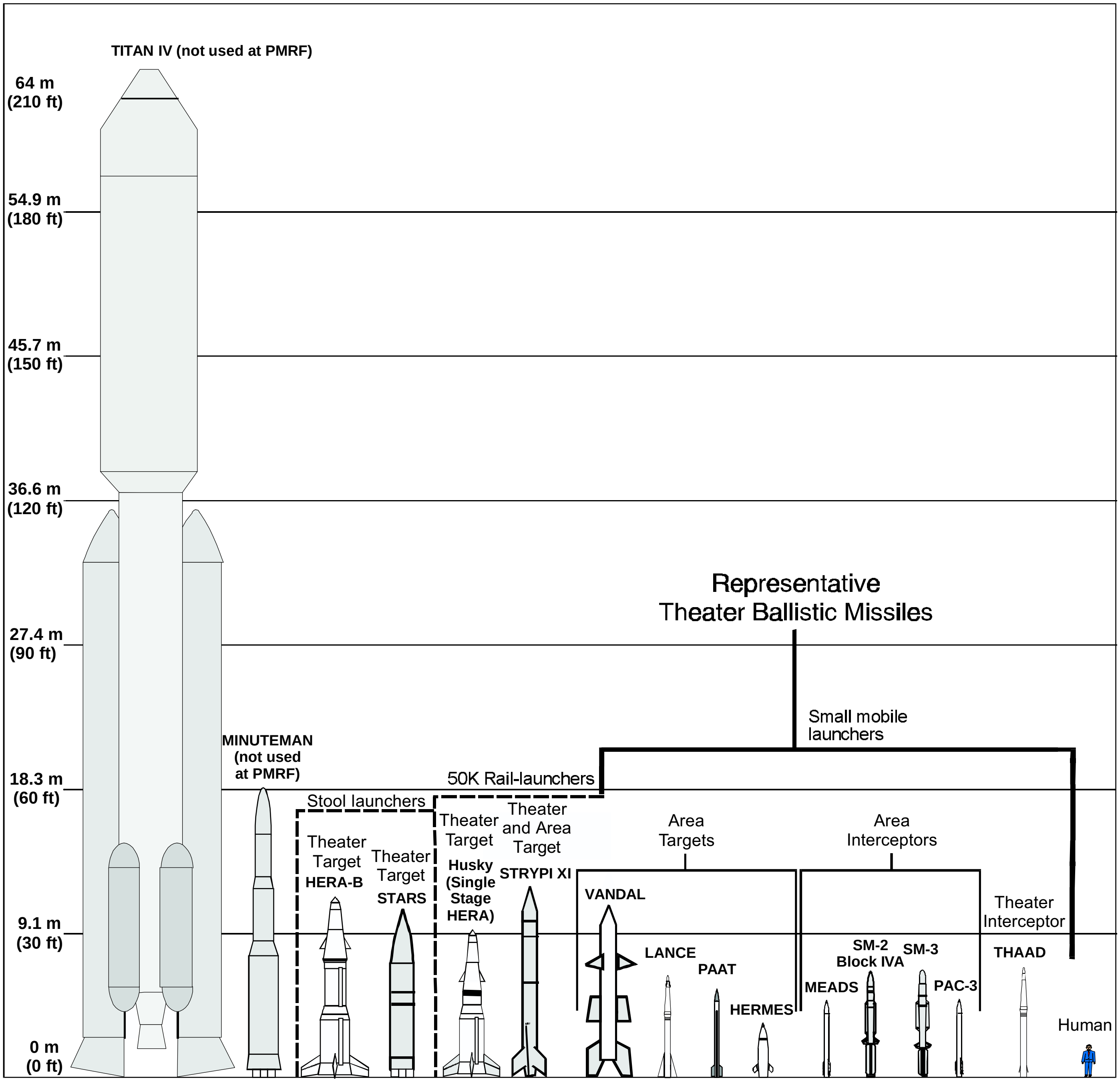
Typical Exercise Aerial Targets Used at PMRF

Figure 2.2.1-3



Note: Titan IV included for comparison purposes only.

PAAT PATRIOT as a Target

Typical TBMD Target and Interceptor Missile Vehicle Comparison (Revised)

Figure 2.2.1-4

2.2.1.4.3 Gunnery

Naval guns provide the final point defenses in the multiple layers of defense necessary for ships at sea. Gunnery training operations involve the use of highly automated guns against surface (ships or simulators) or aerial targets. They give crews experience in dealing with threats from air attack and sea-skimming missiles that require extremely fast reaction times and a heavy volume of fire. Naval aircraft also practice shooting guns against surface or aerial targets. Gunnery operations are conducted in Restricted Area R-31 1 and Warning Areas W-18 and W-18 (see section 3.1.1.2, Airspace). Table 2.2.1-3has been moved to table A-18, appendix A.~~describes each gunnery exercise conducted at PMRF and identifies typical participants and duration of the exercise.~~ Typical gunnery exercise weapons are identified in table A- , appendix A.

2.2.1.4.4 Bombing

Bombing exercises involve dropping inert exercise (contains no explosives) or low-yield bombs, depth charges, precision-guided missiles, and aerial torpedoes. The Sinking Exercise (SINKE) involves dropping live bombs or precision-guided air-to-ground missiles on environmentally-approved full-scale hulks placed in water at least 3, 8 meters (m) (12, feet ft) deep.

Weapons used for the bombing training exercises include both precision-guided and unguided munitions ranging in size from 22 kilogram (kg) (pounds lb) to kg (2, lb). Examples of the typical bombs (unarmed) used are given in table A- , appendix A.

These bombs are deployed against existing targets or locations identified by coordinates and intended to represent real targets (virtual targets). Existing targets used for bombing training include the Trimaran Tow Target and Floating at Sea Target (FAST), and environmentally-approved full-scale hulks for bombing. Virtual targets include Fake Island, also known as the Naval Gunfire Scoring System (NGSS), a computer-generated simulated island target described in section 2.2.1. . .1. Fake Island s map coordinates appear on the maps being used for training however, Fake Island does not exist as a land mass. Its coordinates are located over BARSTUR, whose hydrophones acoustically score bomb drops from the sound made when a bomb hits the ocean.

2.2.1.4.5 Mine Warfare Exercises

Mine warfare exercises conducted at PMRF are limited to either the simulated laying of aircraft-deployed mines, where no actual ordnance is dropped, or the use of exercise (dummy) mines and exercise submarine-deployed mines. ~~These are described in t~~Table 2.2.1- has been moved to table A-1 , appendix A.~~, including the identification of the typical participants and duration of the exercise.~~ Typical mining exercise weapons are also given in table A- , appendix A.

2.2.1.4.6 Electronic Warfare Exercises

Electronic warfare training is a critical component of naval combat training and includes training in electronic support measures, electronic countermeasures, and electronic counter-countermeasures. Electronic countermeasures training includes the use of chaff to mask targets with multiple false echoes. The open ocean expenditure of chaff by ships and aircraft is a routine procedure. A protocol is in effect in PMRF controlled range areas. Any range user routinely obtains permission for expenditure of chaff from the PMRF Range Facility Control Officer. This permission is granted based on altitude, wind conditions, and distance from land areas to ensure no chaff is blown on or near Kauai or Niihau. Although there is no formal tracking of number of expenditures, a rough estimate is 1   ship and 1   aircraft operations per year. Electronic warfare exercises can include up to four ships, one or two submarines, PMRF range boats, and aircraft. Usual duration is from   to 8 hours.

Table 2.2.1-   has been moved to table A-2 , appendix A ~~describes each electronic warfare exercise conducted at PMRF, including the typical participants and duration of the exercise~~. Typical electronic warfare assets used are given in table A- , appendix A.

2.2.1.4.7 Anti-Submarine Warfare Exercises

In anti-submarine warfare exercises, the Navy employs a combination of submarines, surface ships, and aircraft equipped with sensors and anti-submarine weapons. Anti-submarine warfare tactics consist largely of narrowing a general location into a precise one and then attacking. The search phase involves sensors such as sonars, non-acoustic sensors, and airborne early warning radars.

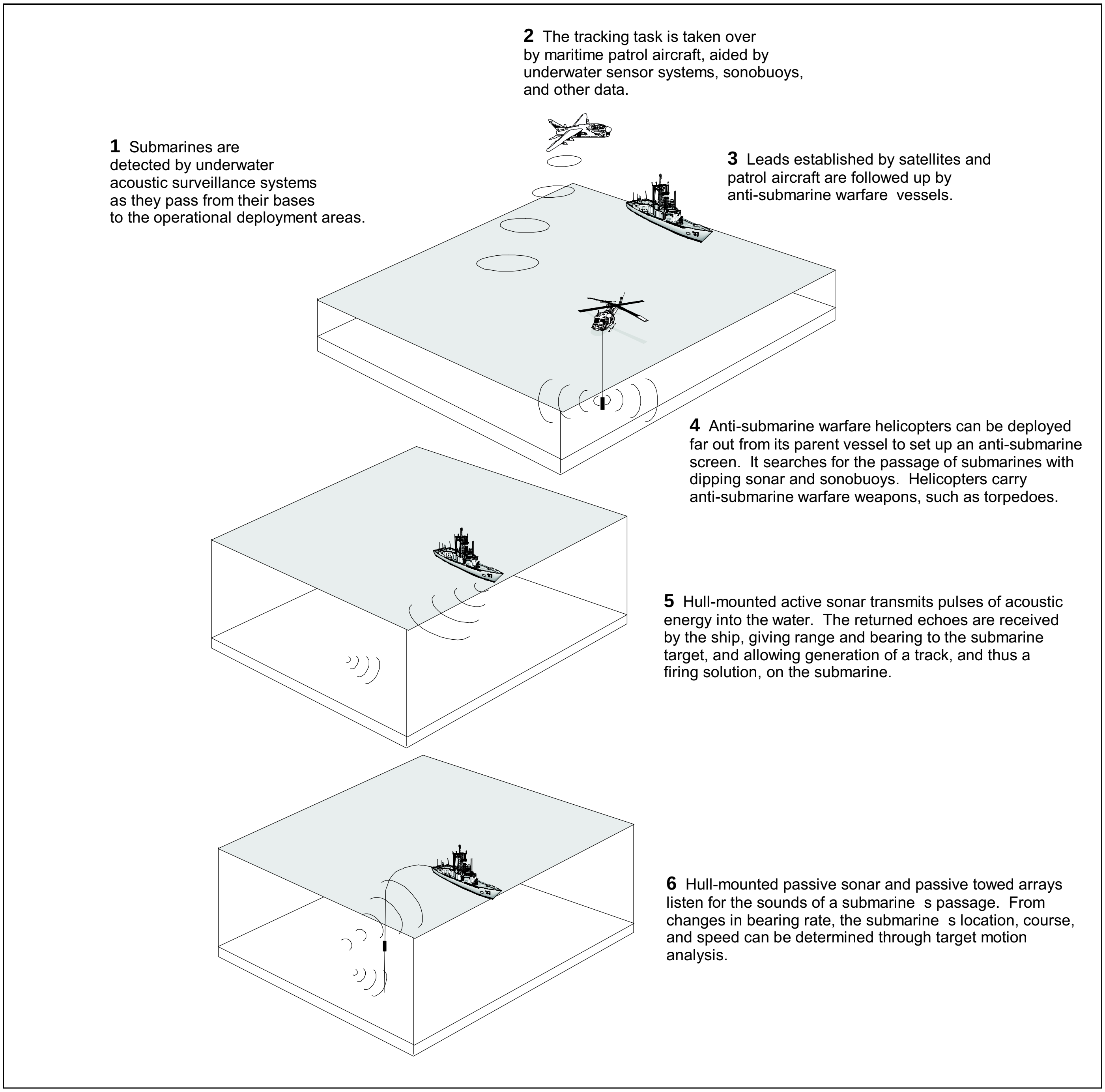
Figure 2.2.1-   illustrates the kinds of exercises conducted and the weapons, sensors, and targets used. Table 2.2.1-   has been moved to table A-21, appendix A ~~describes each anti-submarine exercise conducted and identifies the typical participants and duration of the exercise.~~ These exercises usually include a surface ship, a submarine or other underwater target, and anti-submarine warfare aircraft. Exercises last from   hours to a week. Typical anti-submarine exercise weapons used are given in table A- , appendix A.

2.2.1.4.8 Submarine Operational Exercises

Submarine operational exercises involve training in (1) using active and passive sonar systems to find targets, (2) simulating attacks with exercise torpedoes in deep and shallow water and through thermoclines (layers of water with differing temperatures), (3) avoiding detection by anti-submarine warfare weapon systems, and ( ) defending against enemy torpedoes with evasive maneuvers and the use of torpedo countermeasures. Specific submarine exercises conducted at PMRF involve one or more submarines, targets, and recovery boats or helicopters. These last from 8 hours to   days. ~~are described in t~~Table 2.2.1-   has been moved to table A-22, appendix A. Typical submarine exercise weapons are given in table A- , appendix A.

2.2.1.4.8.1 Underwater Minefield Detection Training

For minefield detection training, submarines use an underwater minefield located west of Port Allen. Thirteen exercise mines are bottom-mounted, tethered at different heights above the sea floor, and spaced about 1,82 m (,   ft) apart. Batteries in the mine transponders are replaced once a year by grappling and retrieving the mine and its anchoring chain. An average of one exercise per month uses the minefield.



Current Fleet Operation and Anti-Submarine Warfare Training at PMRF: Notional Illustration (Revised)

Figure 2.2.1-5

2.2.1.4.9 Underwater Tracking

The PMRF underwater tracking system supports the anti-submarine warfare and submarine exercises, as well as gunnery and bombing exercises. It encompasses the in-water subsystems for the BARSTUR and the BSURE Ranges (figure 2.2.1-), their respective shore amplifiers and power support subsystems, and the data processing and distribution subsystems. HATS (figure 2.2.1-), located off Maui, is also used for anti-submarine warfare exercises, submarine operational exercises, and Research, Development, Test, and Evaluation (RDT E) involving underwater systems to be tested.

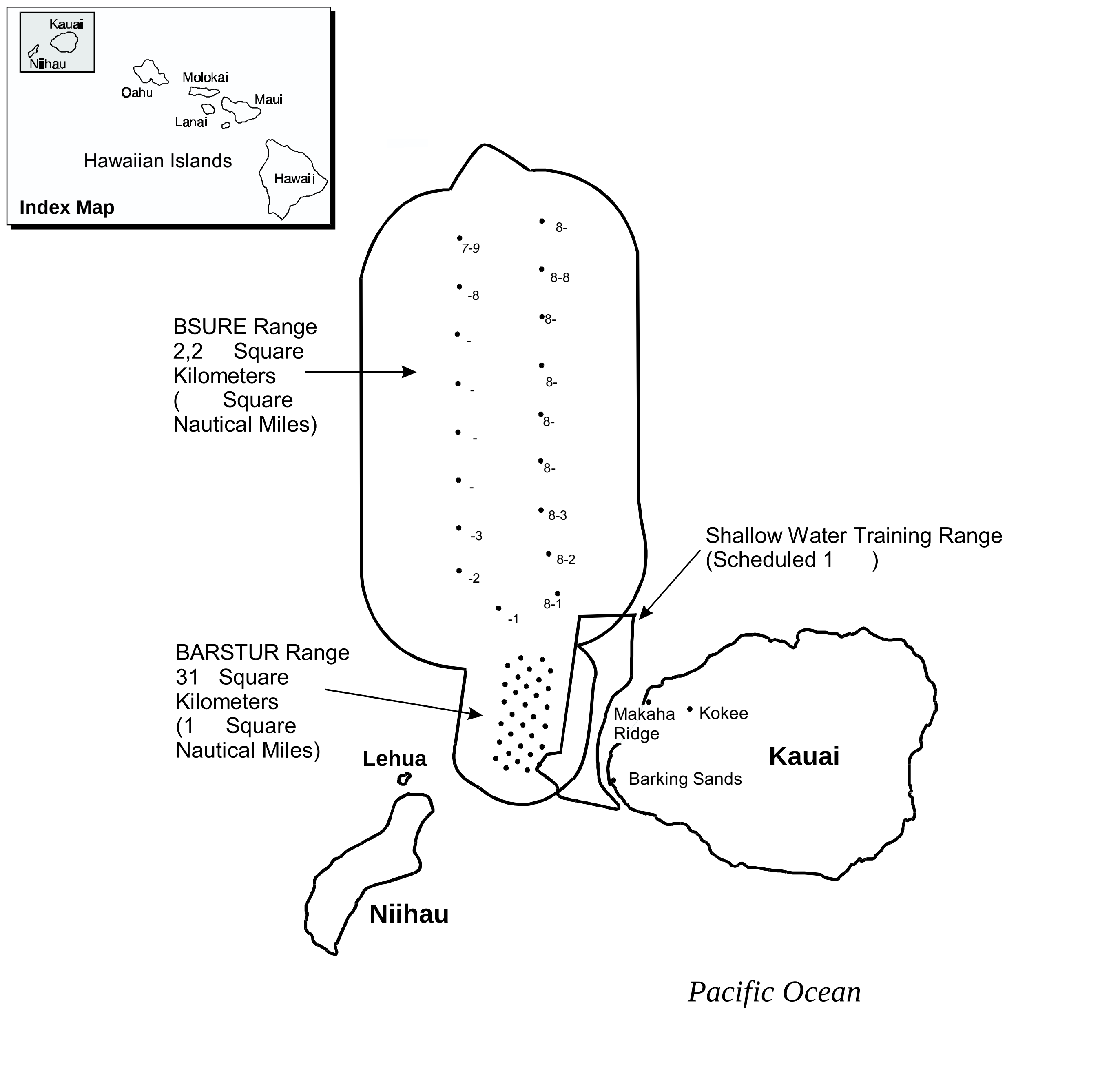
Passive bottom-mounted hydrophones receive signals from pingers mounted internally on torpedoes, underwater targets, and submarines. The pingers are mechanically, electrically, and acoustically compatible with a wide variety of underwater craft. Pinger signals received by the hydrophones flow through a sea/land cable system to the signal processing and display systems in the Operations Control Center. Hydrophone reception of tracking pinger signals provides real-time tracking data of submarines, underwater targets, and underwater weapons.

Underwater instrumentation will be installed to support the Shallow Water Training Range (SWTR) offshore of PMRF/Main Base. The SWTR (see figure 2.2.1-) will provide PMRF with the capability to monitor ongoing Navy training exercises being conducted in shallow water areas. Offshore, 118 underwater nodes on the ocean bottom are connected through electrical-mechanical optical cables to existing shoreside facilities at PMRF/Main Base. During training exercises, the nodes receive in-water acoustic signals from submarine, target, and torpedo pingers, which are transmitted to a shore-based operations center. The cables come ashore within the existing submerged cable right-of-way covered by State General Lease 3 2. (Pacific Missile Range Facility, Barking Sands, Hawaii, 1 , Apr, p.2-1 through 2-). 8

2.2.1.4.9.1 Naval Gunfire Scoring System

The Naval Gunfire Scoring System (NGSS) gathers data for scoring of surface ships conducting shore bombardment exercises, and for scoring aircraft conducting gunnery and bombing exercises. Ships fire their exercise rounds, and planes drop their exercise bombs, at coordinates that lie on the ocean surface and within the tracking capabilities of the underwater tracking systems described above. These coordinates simulate a land-based target located over the BARSTUR Range ust northwest of PMRF/Main Base. The underwater tracking system s hydrophones detect the water impacts and direct their data to the NGSS processing equipment, where accuracy is scored.

In addition to impact rounds, the system provides scoring for a variety of pro ectiles including illumination and airburst rounds. ~~The NGSS optical subsystem detects and localizes illumination rounds, smoke from high energy rounds, and courterbattery smokes. The system employs two digital cameras and associated camera mounts, image processing hardware, ancillary equipment, and software to control the processing and delivery of video images.~~ The NGSS optical subsystem detects and locates illumination rounds, smoke from high energy rounds, and counterbattery smokes. The system uses digital cameras and associated camera mounts, image processing hardware, and ancillary equipment and software to control the processing and delivery of video images.



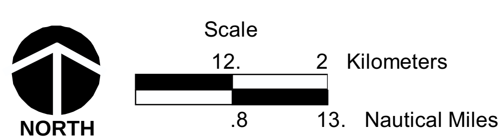
Source: Modified from U.S. Department of Defense, 1 1, Sep, p.3.

EXPLANATION

• Hydrophone

BSURE Barking Sands Underwater Range Expansion
BARSTUR Barking Sands Tactical Underwater Range

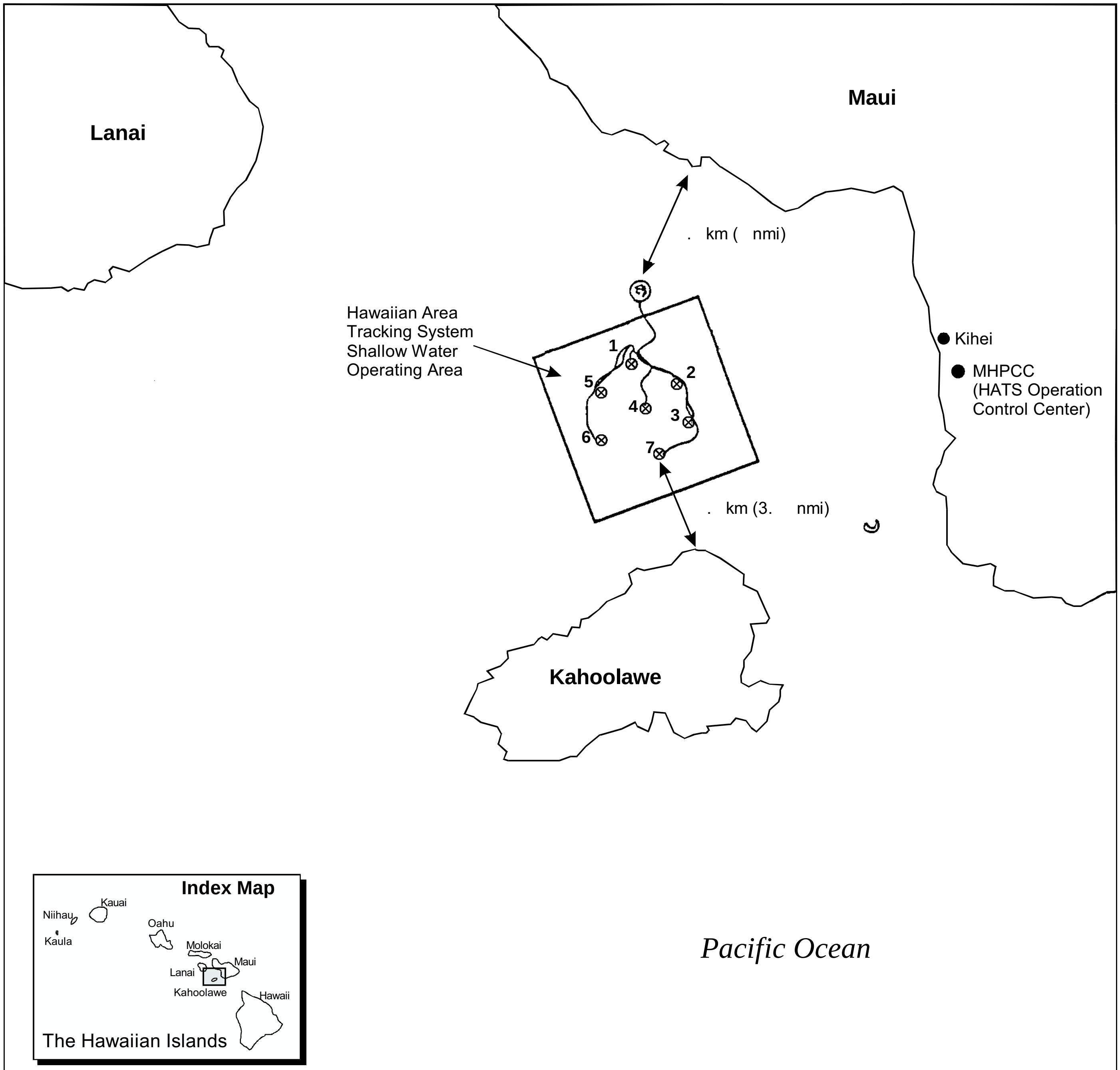
Pacific Missile Range Facility Underwater Ranges



Hawaiian Islands

Figure 2.2.1-6

naa underwater 1



Source: Modified from Pacific Missile Range Facility, 1 , 2 Jun, p.2 .

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EXPLANATION

⊗ Hydrophone

nmi nautical mile
km kilometer
MHPCC Maui High Performance Computing Center

NORTH

Scale
. 13 Kilometers
3. .1 Nautical Miles

Hawaiian Area Tracking System (Revised)

Hawaiian Islands

Figure 2.2.1-7

naa tracking 1

One camera mount is at the PMRF Launch Pad at the north end of PMRF, and the other is at Makaha Ridge, referred to as remote optical sites 1 and 2, respectively. Events are detected and located through triangulation from these two remote optical sites.

2.2.1.5 Land-based Training and Operations

In addition to the fleet training exercises described above, PMRF conducts a number of land-based operations to support those exercises, as well as a number of land-based training exercises. These are described below.

2.2.1.5.1 Aerial Target and Missile Launches

Surface-launched aerial targets are fired from the PMRF launch pad facility on the north end of PMRF. The DOE operates KTF as a tenant of PMRF. The KTF launches research-related rockets and ballistic targets for tracking exercises from sites at the north and south ends of PMRF. The current restrictive easement boundary and ground hazard area boundaries associated with launches from KTF are discussed in section 3.1.2.

2.2.1.5.1.1 Missile Launch Preparation

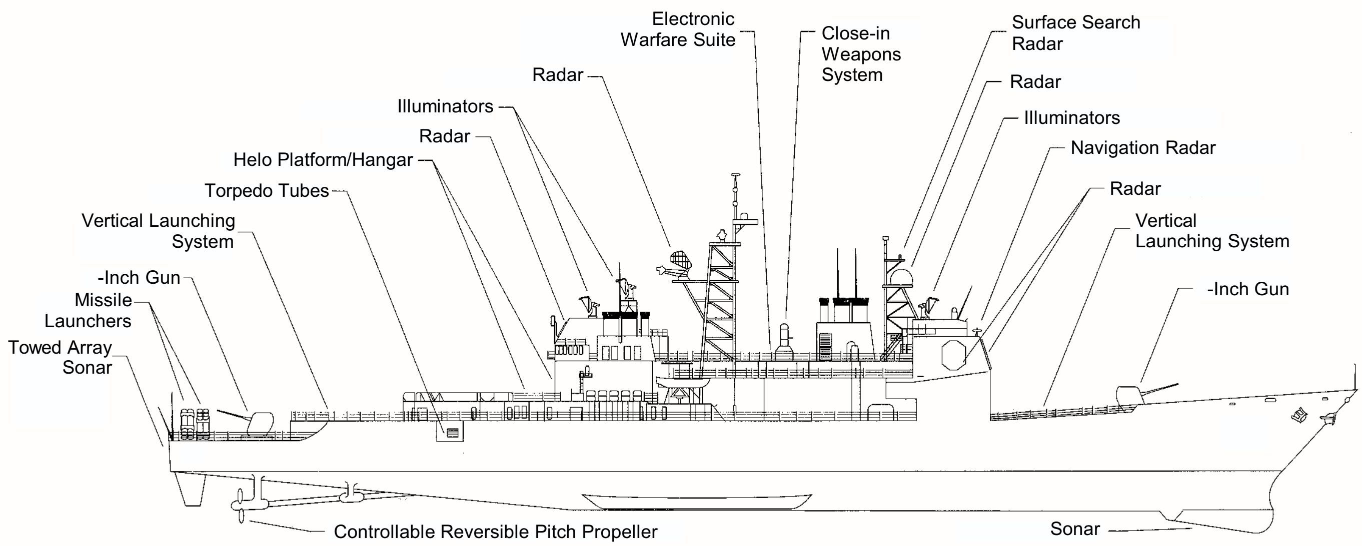
Missiles and support equipment come to PMRF by aircraft or DOD/Department of Transportation (DOT)-approved over-the-road common carrier truck from government storage depots or contractor facilities. They are then placed in secure storage until assembly and launch preparation. Applicable safety regulations are followed in transporting and handling hazardous materials. PMRF establishes and maintains appropriateESQDs around facilities where ordnance is stored and handled.

2.2.1.5.1.2 Missile Launch and Flight

Missiles are launched from fixed or portable launchers and fly on tra ectories that simulate real threat-missile flight profiles. Tra ectories and range vary greatly depending on the training exercise scenario. Intercept debris impact zones, target and defensive missile impact zones (in the event of a failed intercept), and booster impact zones are all confined to open areas of the sea that have been determined clear of ships, vessels, watercraft, whales, etc. Prior to missile launches requiring the Navy to exercise closure of the ground hazardarea, Range Safety officials issue NOTAMs and NOTMARs identifying areas to remain clear of and the times that avoidance of the area is advised. The Range Safety officials then determine that the areas are clear of both surface vessels and aircraft. If ships or fishing boats are seen in an impact area, their cooperation is requested to leave the area voluntarily. Launches are put on hold until the impact area is clear of traffic.

One example of a mobile interceptor launch platform is an AEGIS cruiser, shown in figure 2.2.1-8. The MATSS is an example of a mobile targets launch platform.

A plan diagram (figure 2.2.1-) shows the typical target-missile launch hazard areas, including the booster drop zones, and intact-target-vehicle impact zones. Impact zones are areas where hardware impacts are planned. Location and dimensions of the impact zones may change for each target flight scenario depending upon the characteristics of the specific training target or test missile. Missile flight safety personnel use detailed launch



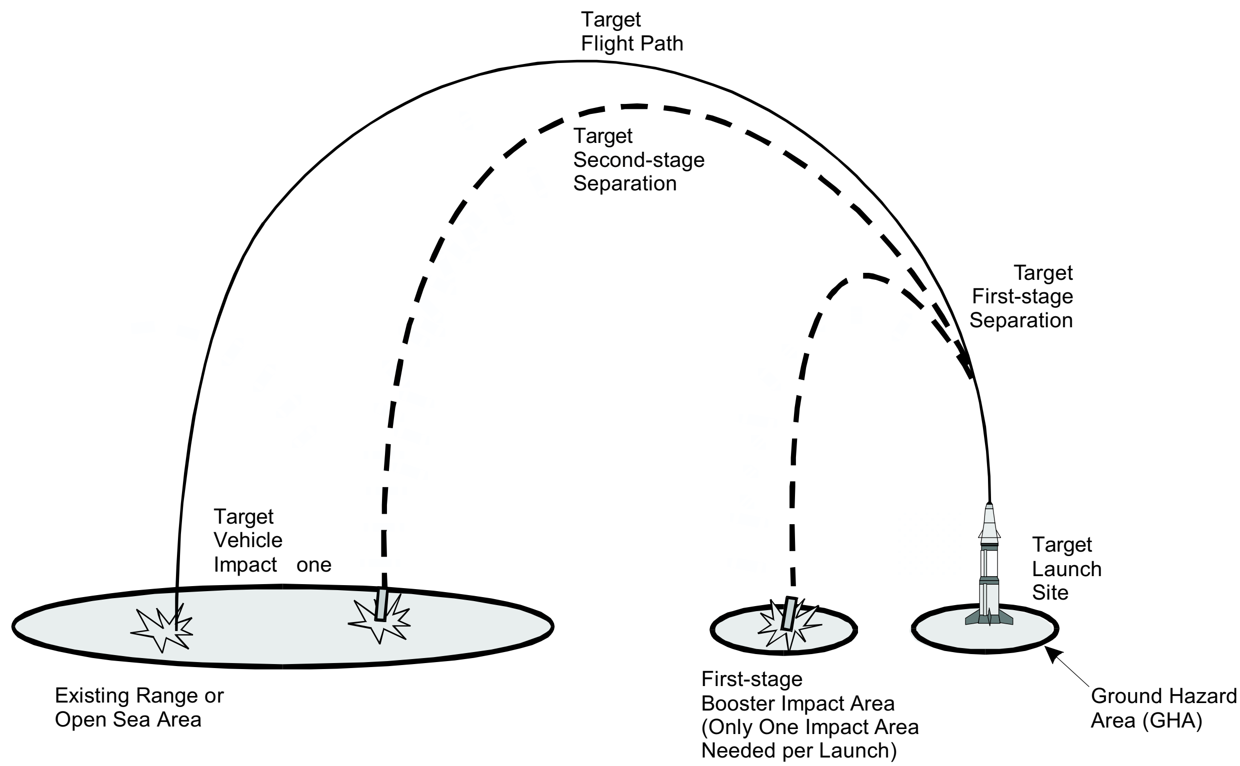
Ship Characteristics

Length	Feet	Draft	32.2 Feet
Beam	Feet	Displacement	, Tons
Speed	3 Knots	Accommodations	Personnel

Typical AEGIS Cruiser

Figure 2.2.1-8

Not to Scale



Source: Modified from U.S. Army Space and Strategic Defense Command, 1 , Jan, p.2- .

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Typical Target Missile Hazard Areas

Figure 2.2.1-9

Not to Scale

naa hazard 1

planning and trajectory modeling to determine impact areas for each missile training exercise or missile test flight.

Boosters, target missiles, and payloads that impact the sea may be recovered for analysis and disposal. To assist in locating target payloads, surface and airborne sensors may cover anticipated impact areas. Target missiles and payloads would also carry locator beacons, which are designed to survive impact and transmit a radio signal to assist recovery boats.

Figure 2.2.1-4 illustrates the relative size and scale of these missiles.

2.2.1.5.1.3 Solid Propellant Target Launch Vehicles

Most solid propellant rocket motors used were originally developed for other DOD missile programs. Many are existing surplus motors that are currently stored at DOD bases and depot facilities. Some target missile components, such as fairings and interstage adapters, are developed and fabricated specifically for the target missiles. Guided target system launch vehicles contain a flight termination system (FTS) to terminate the flight of the launch vehicle safely if an unsafe condition develops during flight (such as an off-course flight). The FTS is activated by Range Safety personnel. An explosive charge is detonated which ruptures the rocket motor. The resulting loss of pressure terminates the motor’s thrust. The target missile then falls into the ocean. Typical solid-fuel launch vehicles are listed in table A-3, appendix A.

2.2.1.5.1.4 Liquid Propellant Target Launch Vehicles

Most liquid propellant rocket motors used are motors that were originally developed for other DOD missile programs, or Foreign Material Assets (FMAs). Many are existing surplus motors and are currently stored at existing DOD bases and depot facilities. Some target missile components such as fairings and interstage adapters are developed and fabricated specifically for the target missiles. The target system launch vehicles may contain an FTS, as described above for solid propellant target launch vehicles. Typical liquid fuel launch vehicles are listed in table A-3, appendix A.

2.2.1.5.2 Electronic Warfare Operations

PMRF has both fixed and mobile, shore-based electronic countermeasures or electronic attack and electronic threat simulator systems at PMRF/Main Base, Makaha Ridge, the Island of Niihau, and at Naval Air Station (NAS) Barbers Point and Mauna Kapu on Oahu. These are supplemented by airborne and shipboard systems.

2.2.1.5.2.1 Electronic Countermeasures

Electronic countermeasures include both active jamming and passive techniques. Active jamming includes noise jamming to suppress hostile radars and radios, and deception jamming, intended to mislead enemy radars. Passive electronic countermeasures include the use of chaff to mask targets with multiple false echoes, as well as the reduction of radar signatures through the use of radar-absorbent materials.

Electronic countermeasures systems at PMRF/Main Base include transportable ammers. These transportable ammers can be set up at remote sites. Communications amming equipment is also available. Makaha Ridge has four ammers. On Niihau, the small Perch Site is capable of accommodating up to four of the transportable ammers that are stored at PMRF/Main Base. NAS Barbers Point on Oahu has a transportable low-power ammer that is used for in-port training with AEGIS class ships in Pearl Harbor.

2.2.1.5.2.2 Simulator Systems

Simulators include radar emission simulating sets designed to represent a radar threat. By varying the signature (frequency, pulse width, pulse repetition interval, and scan type) of radars, the sets can represent up to approximately 1 different radars.

PMRF has fixed and mobile shore-based simulator systems at PMRF/Main Base, Makaha Ridge, at the Perch Site on Niihau, and at NAS Barbers Point and Mauna Kapu on Oahu. Several additional sites on Niihau are used for the employment of transportable threat simulators. Typical systems are listed in table A- , appendix A.

2.2.1.5.2.3 Weapons (Pyrotechnics) Used

Simulated surface-to-air missiles (SAMs) called SMOKE SAMs are launched against helicopters or other aircraft from one or more of six locations at PMRF/Main Base. They fly to an altitude of approximately 3 m (1, ft) so that the helicopters or aircraft can practice evasive tactics, including evasive maneuvers and/or dropping infrared flares or chaff. A total of SMOKE SAMs were launched in 1 , percent from PMRF/Main Base.

2.2.1.5.3 Sensor Instrumentation Operations

PMRF instrumentation measurement systems provide precision air and surface radar tracking, land-based and airborne surface and air radar surveillance, underwater tracking, and telemetry data recording and display. These systems simultaneously support participants, targets, and weapons in underwater, surface, and air environments.

2.2.1.5.3.1 Radar Systems

Precision tracking, surveillance, and identification-friend-or-foe (IFF) radars are located at PMRF/Main Base, Makaha Ridge, and Kokee on Kauai on Niihau and at Kaena Point and Mount Kaala on Oahu. The tracking radars use four optical directors: two at PMRF/Main Base, one at Makaha Ridge, and one at Kokee. The optical directors furnish separation information on higher altitude operations to identify participants and to spot small craft with low radar reflectance characteristics in the close-in BARSTUR area. Two PMRF range aircraft are equipped with airborne search radars. The tracking, surveillance, and IFF radar resources combine to provide coverage throughout the warning areas and approach corridors from Oahu and are described in table A- , appendix A.

2.2.1.5.3.2 Optical Systems

In addition to the NGSS optical subsystem identified in section 2.2.1. . .1, PMRF also has a surveillance monitoring subsystem that supports Range Safety and Base Security functions. Cameras are located at various points throughout PMRF facilities, providing remote, unmanned surveillance. Four video cameras are also installed at the PMRF LC, providing input to both surveillance monitoring and the Range Video Operations Support Center. (U.S. Navy, 1 , March, p. -3 and 8-2) 1

A mobile, trailer-mounted system, the Intermediate Focal Length Optical Tracking System (IFLOTS), is used primarily to track and record missile launches from PMRF. The self-contained IFLOTS unit can be located virtually anywhere a truck can go in the vicinity of PMRF to provide remote video relay. A GPS receiver, configured into the system, gives the precise location of the unit. (U.S. Navy, 1 , March, p.8-2) 1

Weather stations at each remote optical site provide data that is used to develop a correction factor for target vectors to compensate for atmospheric distortions. The video data from the remote optical site cameras aids detection and evaluation of exercises on the range.

2.2.1.5.3.3 Telemetry Systems

Telemetry systems equipment is used to receive data transmitted by missiles in flight. Makaha Ridge has two 3-m (1 -ft) parabolic dish telemetry tracking antenna systems and three 1 -m (33-ft) parabolic dish tracking systems that receive telemetry signals from low-flying missiles at a range of 111 km (nmi). An additional 3-m (1 -ft) dish is located at Kokee. This tracking antenna can receive telemetry signals from a low-flying missile at a range of 1 km (nmi) or for tracking high altitude exoatmospheric re-entry vehicles.

Makaha Ridge houses receivers, recorders, telemetry, processing, and display equipment that displays and records the telemetry data. The data are transmitted fromKokee to Makaha Ridge and to PMRF/Main Base for processing.

PMRF also uses an airborne relay system to extend the range of aerial target (drone) flights by re-transmitting command and control and telemetry signals between the ground station and the aerial target. This multiple aircraft, GPS-integrated system is an ultra high frequency (UHF) command and control and telemetry system for multiple aerial target control. It consists of two ground station facilities, an airborne relay, and target transponders. A transponder on the aerial target allows tracking of the communications with the aerial target during the over-the-horizon or extended range drone flights.

2.2.1.5.4 Communications System Operations

Communication systems at PMRF include ground, radio, microwave, and underwater communications time generation distribution and display systems and closed loop television systems. They are either range communications systems and/or base communication systems. The range communications use specialized telecommunications, radio, video, microwave, and underwater equipment to fulfill range operational requirements. The base communications provide administrative communications with government agencies and commercial businesses.

2.2.1.5.4.1 Range Telecommunications Systems

The range communications systems transmit voice and data signals between range sites and areas. Transmission media include wire, radio, microwave, and fiber-optics. Microwave circuits link into the Wheeler Network Segment Control (WNSC) at Wheeler Air Force Station (AFS), Oahu. Voice and data circuits transmit through WNSC and access other U.S. mainland and Western Pacific ranges. Commercial leases provide data circuits on fiber optic cable to link PMRF, Oahu, Maui, and U.S. mainland sites. There are also leased fiber optic communications circuits: one from PMRF to Oahu and Maui, and one from PMRF to the U.S. mainland.

Radio Communications

Primary radio communications for operations are provided by high frequency (HF)/very high frequency (VHF)/UHF radios at Kokee, Makaha Ridge, and Mount Kaala, Oahu. Communication with local fishermen and surface craft is by a citizen s band radio in the Range Operations Control Center.

Microwave Communications

Microwave systems provide voice and data communications between PMRF/Main Base, Makaha Ridge, Kokee, the HIANG facility at Kokee, and Mt. Keala/Kaena Point. Another link remotely controls operation of the surveillance radar at Niihau and returns radar data to PMRF/Main Base. The Hawaii Digital Microwave System (HDMS) links the HIANG facility at Kokee to the Hawaii Regional Operations Center (HIROC) facility at Wheeler Army Air Field, Oahu.

Underwater Communications

Underwater communication with submerged or surface craft in the BARSTUR and BSURE is provided through five underwater sound pro ectors connected with the voice communication system. Submarine voice transmissions are received through the underwater range hydrophones. Underwater communications capability can expand beyond the range of the fixed, bottom-mounted pro ectors using range boat hull-mounted transducers.

Integrated Target Control System

Aerial and surface targets used on the Range are controlled by the Integrated Target Control System (ITCS), an integrated target control and data measuring system which can control up to four targets simultaneously with four remote trackers at Makaha Ridge and two target control consoles in the Range Operations Control Center (Pacific Missile Range Facility, 1 1, p.121 through 122). 8

2.2.1.5.4.2 Base Communication System

The base communication system consists of an administrative telephone system that is tied into long-haul commercial facilities.

2.2.1.5.4.3 Frequency Monitoring

Frequency monitoring on Oahu and Makaha Ridge protects range and Range User frequencies during operations. The monitoring facilities on Oahu are at Mauna Kapu and in a mobile van staged from Barbers Point. A portable generator is used for frequency monitoring lasting more than 2 hours.

2.2.1.5.5 Land-based Training

The Army, HIANG, Army National Guard, and Marine Corps use PMRF for land-based military training. Training, and test and evaluation operations vary from relatively simple to very complex. A simple operation may consist of a small-unit amphibious landing and ground maneuvers. More complex operations may involve several combat systems, multiple targets, multiple platforms, and multinational military units operating in subsurface, surface, and air scenarios. An example of the latter is the biennial Rim of the Pacific exercise (RIMPAC).

Joint Task Force exercises include amphibious landings using air-cushioned landing craft restricted to beach areas, and amphibious assault vehicles, which are allowed to cross the nearby road and travel toward the airfield. The Army National Guard conducts about one exercise per year, which usually involves landing on a field and working a field problem. The HIANG conducts mobility training exercises at the airfield. Land-based training exercises include Mobile Inshore Undersea Warfare exercises, downed pilot survival training, helicopter low altitude training, and Special (recon) Warfare exercises. These are small events lasting several hours to 1 days. The downed pilot survival training, helicopter low-altitude terrain flight training, and special warfare exercise are held on Niihau, along with low-altitude cruise missile terrain-following exercises. All of these are conducted in areas well removed from the population center of Niihau. Table 2.2.1-8 has been moved to table A-23, appendix A.~~describes each exercise and identifies the typical participants, duration of the exercise, and weapons and targets used.~~

2.2.1.5.6 Other Miscellaneous Exercises and Activities

PMRF conducts other miscellaneous exercises, sometimes referred to as service and in-house exercises. They include ballistic missile tracking, radar tracking, radar calibration, and KTF support operations. Table 2.2.1- has been moved to table A-2 , appendix A.~~describes each exercise or activity and identifies the typical participants and weapons and targets used.~~

2.2.1.6 Testing and Evaluation Activities

PMRF s secondary mission is supporting RDT E pro ects. Current ongoing programs at PMRF include torpedo, torpedo defense, submarine and periscope detection, submarine systems, anti-submarine warfare, ship-defense systems, land sensor, and other miscellaneous programs. These programs involve the testing and evaluation of enhancements on systems already used in exercises conducted at PMRF. These are described briefly below.

- Chief of Naval Operations (CNO) pro ects are usually related to test and evaluation research. In some, tactical variables are studied against underwater, surface, airborne, and ballistic missile threats. Other CNO pro ects study proposed or new hardware and software designs.

- Torpedo RDT E programs include a torpedo development testing program involving deep and shallow-water testing of aircraft, helicopter, and surface ship-launched anti-submarine torpedo sensors ~~and overall operation an advanced capability torpedo testing program~~ to increase their operational ~~depth~~ performance. ~~or expand the operating envelope of the torpedo and an advanced torpedo testing program to improve the shallow-water operational performance of this long-range, anti-submarine and anti-surface ship torpedo.~~

- Torpedo defense RDT E programs include a surface-ship torpedo-defense program, involving the testing of new systems to counter incoming torpedoes~~, including gunnery, ship operating maneuvers, and torpedo countermeasures testing of acoustic devices, towed torpedo decoys, and homing anti-torpedo weapons~~.

- Submarine detection RDT E programs include an advanced sensor application program for locating submarines. Periscope detection programs include: radar, optical, and laser testing from airborne, ground, and surface ship platforms~~ a radar software development program designed to eliminate the ocean wave background noise using a commercial, off-the-shelf, Furuno radar and two land-based Electronic Electromechanical (E-2) radar programs~~.

- Development, testing, and evaluation of a self-propelled underwater vehicle with a surface-piercing mast~~, which is preprogrammed or radio-controlled, can operate on the underwater tracking range or at a remote site, and can be launched and retrieved using PMRF s Weapons Recovery Boat (WRBs)~~. The system simulates a submarine periscope for the purpose of detection training.

- ~~RDT E programs to develop anti-submarine warfare include an over-the-horizon guidance research program involving AEGIS ships and the Light AirborneMulti-Purpose System (LAMPS) sensor mounted on a helicopter whose sonobuoys form, in effect, an over-the-horizon supplement to shipboard sensors such as a towed array (AEGIS anti-submarine warfare).~~

- Ship defense system RDT E programs include chaff and flare countermeasures testing.

- ~~Submarine system RDT E programs include a software development program for upgrading Tomahawk missile software and for testing new tracking sonar systems, and a submarine electronic warfare systems upgrade program for testing electronic surveillance measures.~~

- ~~Land-based sensor RDT E programs include the Large Area Tracking Range program, a new tracking system primarily involving computer software upgrades.~~
- ~~The Radar Surveillance Technology Experimental Radar Program involves the integration of new technologies into the existing E-2C radar. It is sponsored by the E-2 Program Office, Naval Air Systems Command.~~
- Current ongoing technology demonstration testing and training activities include booster separation controlled test vehicle flights (CTV-1 and CTV-2).
- Gunnery/special weapons tests include the usually one-of-a-kind adaptation of an existing weapon to meet a unique threat situation. The weapon is either mounted to or fired from a boat offshore of PMRF/Main Base or set up west of the PMRF launch facility. Targets include surface targets and small radio-controlled planes.

2.2.1.7 Summary of Range Testing and Operations

PMRF is used extensively and intensively. The number of exercises and operations conducted, and the number of hours the range is scheduled varies daily, monthly, and annually. Over the last fiscal years, PMRF averaged 82 individual operations per year, ranging from a low of 831 operations in fiscal year (F) to a high of 1,1 operations in F . The range was scheduled an average of , 31 hours per year over the same period, ranging from a low of ,1 hours in F 2 to a high of ,238 hours in F . Table 2.2.1-1 has been moved to table A-2 , appendix A. In general, operations are most frequent during summer months and least frequent during winter. Peaks in activity are related to large~~-~~scale events such as the Mountaintop exercise (a cruise missile tracking evaluation), HOLL WOOD (submarine prospective commanding officer training, and the RIMPAC military training exercises.

Although all of the training exercises and RDT E operations identified in section 2.2.1 take place at PMRF, a relatively small number of exercise types tend to dominate both the number of individual operations performed and the number of range hours scheduled. In the years between F 2 and F , for example, Electronic Warfare Exercise (EWE) accounted for the largest number of individual operations, ranging from a low of 2 percent of the total operations in F to a high of 3 percent of all operations in F 2. Just five types of exercises accounted for 8 percent of all operations in F (EWE ,Submarine Warfare Exercise (SUBE), Wide Area Defense, Air Anti-Submarine Warfare Exercise (AIRASWE), and AEGIS Post Delivery Test and Trial (PDT T), in descending order).

In terms of range hours scheduled over the same -year period, electronic warfare exercises also occupied the single largest number of range hours scheduled for of the years, averaging 2 percent of the actual hours scheduled, ranging from a low of 1 percent in F to a high of 2 percent in F 2. Indeed, ust five types of exercise or operations accounted for 8 percent in F (EWE , Wide Area Defense, SUBE , AEGIS PDT T, and RIMPAC, in descending order).

Table 2.2.1-1~~1~~ provides a summary listing of the level of activity for units supported, weapons, and targets used from F 3 F . While the numbers do fluctuate, depending on the types and mix of training exercises conducted at PMRF, the number of units supported increased over the period from 3 to 88 units, the number of missiles fired on the range increased from in F 3 to 1 in F , and the number of targets presented also increased noticeably over the period (table 2.2.1-11).

Table 2.2.1-11: Level of Activity for Units, Weapons, and Targets

	FY93	FY94	FY95	FY96	FY97	FY93 to FY97 Average
Units supported	3		832	88	8 2	8 8
Missiles fired		3	8	1		8
Bombs dropped	1 8	22	1	12	2	1 8
Guns fired	31	2	3	2	3	3
Torpedoes fired	38	3	8			3
Targets		3	31	888	32	3
Air				22		1
Surface	82		1 3	1 3	2 2	138
Underwater	32	2	333	1	81	2 1

Source: Valencia, 1 , 1 Dec, p.1 Tasaka, 1 8, 21 Jan, p.1 Tasaka, 1 8, 2 Jan, p.1. 1 , 11 , 11

2.2.1.8 Future Activities at Pacific Missile Range Facility: Business Base Projections

Fleet training exercises, the associated land-based operations that support them, and the separate land-based training conducted at PMRF are expected to remain within the range identified in table 2.2.1-11 for the foreseeable future, but with the usual weekly, monthly, and yearly variability. However, the level of RDT E is expected to increase slowly.

2.2.2 BASE OPERATIONS AND MAINTENANCE— NO-ACTION ALTERNATIVE

PMRF provides ordnance storage, aerial, surface, and subsurface targets support, range boat target and weapon recovery, marine pro ect support, airfield operations, diving support, visual imaging, instrument calibration support, meteorology, and oceanography activities. In addition, facilities available to military and contractor personnel are found at PMRF. All of these complement the instrumentation support to operations on PMRF s multi-environment range and are described below.

2.2.2.1 Ordnance

Ordnance facilities include the Underwater Weapons Area, the missile assembly building and launch pad, and the Kamokala Magazines. Secondary ordnance holding and service storage areas are also available on the base.

Shipment of ordnance to PMRF is either by surface transportation through the Fleet Industrial and Supply Center, Pearl Harbor, or by aircraft landing on the PMRF airfield. Surface shipments from Pearl Harbor are by barge to Nawiliwili Harbor, Lihue, and are off-loaded and shipped by commercial truck to PMRF. Ordnance arriving on aircraft is off-loaded at PMRF into ordnance vehicles and delivered to their destination. Ordnance, usually delivered by a commercial shipper, is handled in accordance with DOD Explosives Safety Board standards, such as DOD Directive . ,*DOD Explosives Safety Board*, and DOD *Component Explosives Safety Responsibilities*, dated 2 July 1 .

The Underwater Weapons Area handles a variety of exercise weapons systems, including post-run servicing and pre-shipping preparations of torpedoes and mines.

A Red Label Area handles incoming and outgoing ordnance and is centered on the airfield taxiway. A soft pad in the Red Label recovery area is used by helicopters for setting down targets and weapons recovered from the range.

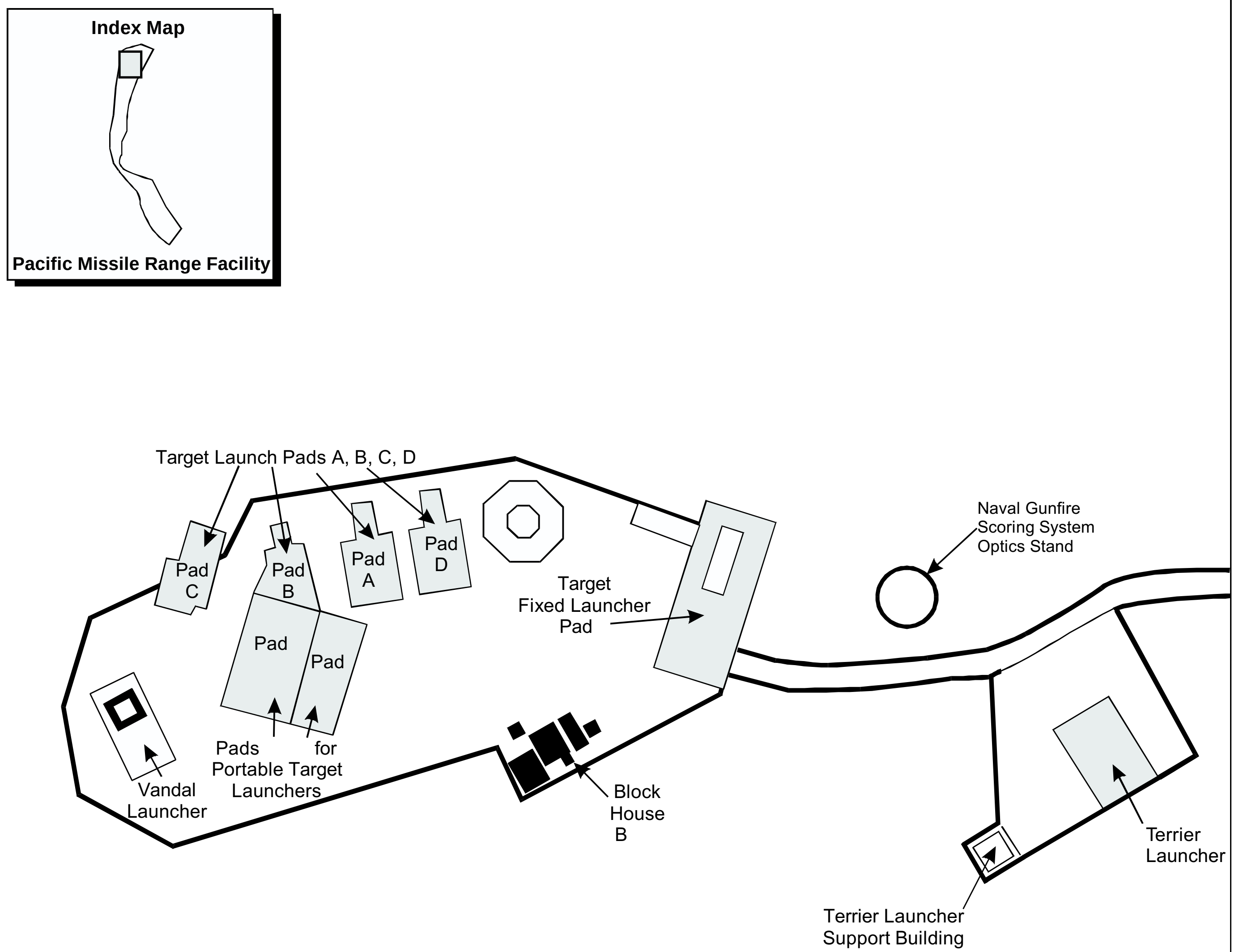
PMRF/Main Base has three ready-service areas for ordnance. Magazine 2 1 is used to hold a limited service stock of explosive devices for the flight line and the paraloft (storage for flight-crew emergency supplies). These devices include smokes, squibs, and life acket flares. The ESQD for this magazine is 23 m (ft). Magazine 2 2 is used temporarily to hold ordnance, such as SMOKE SAMs and small arms ammunition. The ESQD for this magazine is 122 m (ft). A ready-service locker holds explosive devices that must be segregated from ordnance in the missile assembly building. This includes target drone igniters. The PMRF LC (figure 2.2.2-1) contains launchers for various targets and weather rockets that are permanently installed on the launch pad. Provisions for portable launchers are also available. Launch capabilities include an anti-ship missile target launcher, a permanent target drone launcher, tie-downs for two portable target drone launchers, and two meteorological rocket launchers. The LC also has a balloon launcher and wind tower for monitoring weather. A missile assembly building is located east of the launch pad.

2.2.2.2 Aerial Targets Support

The target drones identified in appendix A are maintained and serviced in the Aerial Targets compound located ad acent to the Underwater Weapons Area. Government and operations and maintenance contractor personnel staff this compound. The target drone assembly facility includes the equipment required to support the operations and maintenance of the target drones. ~~Some pieces of standard equipment allow the performance of organizational and intermediate levels of maintenance on these targets, including the following: engine testing and repair, target systems testing, flight control and guidance system testing, airframe handling, weight and balance testing, target decontamination, parachute/recovery systems preparation and installation, and augmentation device testing and installation~~.

2.2.2.3 Surface Targets Support

The SEPTARs at PMRF are maintained at Port Allen. Port Allen is a State of Hawaii harbor facility operating under the urisdiction of the State DOT. The High Speed Mobile Surface Target (HSMST) is hauled on a trailer to launch areas at Port Allen or theKikiaola small boat harbor (figure 2.2.1-1, Index Map). The PMRF towed targets are also maintained and serviced at Port Allen in a warehouse and storage yard leased from a private owner. Between F and F , the SEPTARs were engaged in an average of 13 firing missions, 1 tracking missions, raids, and 8 support missions per year. Over the same period, the Improved Surface Towed Targets (ISTTs) were engaged in an average of five firing missions per year.



Source: Pacific Missile Range Facility, 1 , 1 Nov, p. -18.

80

Pacific Missile Range Facility Launch Complex

Pacific Missile Range Facility, Kauai, Hawaii

Figure 2.2.2-1

NORTH

Not to Scale

naa complex 1

Full-scale hulk targets are obtained from sources other than PMRF. Full-scale hulks are towed to the Range or the Operational Area by Navy or commercial seagoing tugboats.

2.2.2.4 Range Boats Support

Range boat activities include the following: underwater target launch, underwater targets and weapons recovery, electronic-warfare support, test vehicle launch and recovery, aerial target recovery, acoustic test support, range surveillance and clearance, diver operation support, launch/recovery of LAMPS, and search and rescue operations.

PMRF has several range boats, including a twin-screw, diesel-powered Torpedo Weapons Recovery (TWR) boat and the two WRBs, both capable of carrying and launching underwater targets.

~~In addition to communication, navigation, and range instrumentation equipment, b~~Both the TWR boat and WRBs carry oceanographic measuring devices, discussed in the Oceanography section below, and simulators and ammers for electronic warfare support. ~~These devices are discussed in the Oceanography sectionbelow.~~ The surface search radar installed in the TWR boats and WRBs can be used to simulate electronic warfare radar threats. ~~Mounting brackets atop the wheelhouse hold threat emitter simulators and ammers. Supplemental devices can be added to use radio equipment as a communication simulator or ammer.~~

2.2.2.4.1 Berthing Facilities

Range boat operations are based at Port Allen (figure 2.2.1-1). ~~The channel on the pier side is used by the Navy, and pier space is available. Shore power, fresh water, and telephone outlets are available at each range boat berth.~~ Emergency berthing at the more protected pier in Nawiliwili Harbor is allowed during inclement weather. Fuel for the range boats is supplied from aircraft refueling trucks parked at the facility. In F , the range boats consumed 8 ,23 liters (L) (12 ,8 gallons gal) of diesel fuel.

2.2.2.5 Air Support Operations

Air support operations at PMRF include the following: visual and radar range surveillance electronic warfare threat simulation logistics support torpedo, aerial, and underwater target recovery underwater torpedo target launches search and rescue personnel transfers by the range aircraft and helicopters ~~logistics support~~ and instrumentation platform for video, photographic, and electronic warfare devices.

In addition to helicopter and fixed-wing aircraft landings associated with PMRF s mission, the airfield serves as a training facility for landings and takeoffs. The latter s percentage of total air operations ranged from a low of 33 percent in 1 2 to a high of percent in 1 3. The overall number of air operations averaged 1 , 1 over the -year period, but dropped from 18,2 in F 2 to 12,33 in F (Table 2.2.2-1 has been moved to table A-2 , appendix A). Under the No-action Alternative, it is expected that aircraft operations would continue at similar levels. Chapter 3 provides more details on the aircraft operations that occur at PMRF.

2.2.2.5.1 Aircraft Maintenance

Maintenance of PMRF aircraft is primarily performed in the Aircraft Maintenance Hangar. Scheduled and unscheduled maintenance for the helicopters and fixed-wing PMRF aircraft are performed in this facility. The bay area has an Aqueous Film Forming Foam fire protection system.

2.2.2.6 Diving Support

Navy divers are not assigned to PMRF, although several underwater operation and maintenance tasks are performed in support of range activities and facilities each year. The Port Hueneme Underwater Construction Team from California is usually at PMRF for several weeks during the spring, and other groups are at the range for diving activities from time to time. The Diver Support Facility is used by an underwater construction team for servicing and upgrading the PMRF in-water cable systems. It is used by other diving activities when not in use by the Port Hueneme team.

2.2.2.7 Visual Imaging

Surface and airborne range operational photography and video support is provided by the Visual Imaging Service Center in the Photo Lab located on PMRF/Main Base.

2.2.2.7.1 Range Video Services

Real-time video of range operations are received from airborne and surface platforms by fiber optic cables, radio frequency transmitters, and a microwave downlink. Range video assets can be deployed on airborne (helicopter),seaborne (range boats), and land-based (video tracker and fixed mounted) systems. Real-time down-range video coverage of operations extends to 12 km (nmi) to the north and west of PMRF from airborne platforms. Surface platforms are capable of 1 2-km (-nmi) real-time video coverage to the north and west of PMRF.

2.2.2.7.2 Video Teleconferencing Services

Classified and unclassified video teleconferences can be supported by the Defense Information System Network (DISN) Video Services Global network. The DISN provides connectivity to over 2 video teleconferencing centers nationwide.

2.2.2.7.3 Optical Services

Optical services include high quality instrumentation photography from both fixed mounts and mobile equipment. The IFLOTS is a mobile, trailer-mounted system used primarily to track and record missile launches from PMRF.

2.2.2.8 Calibration Laboratory

The Calibration Laboratory includes a test-equipment loan pool and work areas for calibration and repair of electronic, electrical, mechanical, and dimensional test equipment used in PMRF instrumentation, range support systems, and base support functions.

2.2.2.9 Meteorology and Oceanography

Radiosonde (an instrument carried by weather balloons that measures humidity, temperature and pressure and transmits this information back to the ground) observations are made from the surface to 3 , 8 m (1 , ft). Atmospheric weather conditions are monitored at the PMRF Weather Station by radar to detect potential thunderstorms and adverse flight conditions in the local area. Bathythermograph (an instrument designed to record water temperatures as a function of depth) recordings, Wave Rider measurements, and other observations from range boats provide oceanographic data at PMRF.

2.2.2.9.1 Meteorology

Meteorological activities at PMRF include radiosonde and rocketsonde operations, and weather observation and prediction data which are utilized by Range Users and Range Safety. Surface-launched balloons tracked by radar provide wind direction, wind speed, temperature, dew point, relative humidity, index of refraction, and wind shear data at 3 .8-m (1, -ft) intervals up to 3 , 8 m (1 , ft) during daylight hours. A weather balloon is released every workday between :3 and 8:3 a.m. Additional balloons are launched for day or night operations as required. An average of 3 radiosonde balloons per year have been launched over the last three years, for use by Range customers and Range Safety. A weather surveillance radar, an automatic surface observation system (ASOS) semiautomatic weather station, and two meteorological towers also provide weather information.

2.2.2.9.2 Oceanography

Each of the PMRF range boats carry expendable bathythermograph and water current instrumentation. The expendable bathythermograph ocean-data collector is used to measure and plot water temperature versus depth profiles while simultaneously relaying the data to Range Control through the onboard processor and radios. The small bathythermograph cartridges are hand-launched from a rail tube and data returned through a trailing wire. The expendable devices sense and transmit current profile velocity information to a depth of 1, m (, 21 ft). Current velocity versus depth is sensed by a probe released from the buoy and transmitted to Range Control. Data transmission ceases when the probe reaches a depth of 1, m (, 21 ft) and the device scuttles itself and sinks to the bottom.

Wave Rider buoys are used for operations requiring wave height and period data. Whenever a Wave Rider buoy is deployed off PMRF, a transmitter sends the height and period between swells and open water sea information to a receiver in the weather station, including a surf forecast for the PMRF/Main Base area. Additional profiles are obtained from expendable current probes launched from either a WRB or helicopter.

2.2.2.10 Other Support Facilities

On-base housing includes family housing (duplex homes), bachelor enlisted quarters (23 units), transient quarters (1 rooms), and beach cottages (1 units), all located in the southern part of PMRF. Food services at PMRF are provided at three locations.

Emergency services provided on-base include a crash/fire center and a dispensary. The crash/fire center activities include aircraft fire fighting and rescue in support of airfield operations, plus structure and brush fire fighting, and fire prevention instruction. A dispensary provides limited emergency medical care for active duty personnel. It also houses a dental clinic staffed only during the quarterly visits to PMRF by the Naval Regional Dental Clinic, Pearl Harbor.

The Navy Exchange, a branch of the Pearl Harbor Navy Exchange, includes a laundry and dry cleaning service performed by a concessionaire. A range of recreational facilities is essential for maintaining morale and health. PMRF s recreational facilities (described in detail in chapter 3) include facilities for both indoor and outdoor athletics, hobbies, and entertainment.

There are two gas stations on base: a Navy Exchange gas station for active duty and retired military personnel, and a second gas station for dispensing gasoline to military vehicles. PMRF maintains a currently inactive Outdoor Pistol Range in the northwestern portion of the base. The range has a surface danger zone extending 1, m (, ft) and then out over the ocean.

2.2.2.11 Pacific Missile Range Facility Tenant Organizations

PMRF hosts a number of tenant organizations. Some of these organizations, such as the HIANG, do not participate in PMRF s mission, whereas others, such as the NUWC, are critical to PMRF s mission. Activities at these organizations are described below.

2.2.2.11.1 Hawaii Air National Guard

The 1 th Air Control Squadron (1 ACS), a subordinate unit of the 1 th Operations Group (1 OG) under the 1 th Wing (1 WG) of the HIANG, is located on PMRF as a tenant unit. The daily mission of the 1 ACS is to train personnel for their wartime mission, which is to provide the senior Theater commander with a mobile, self-sustainable ground radar element on short notice. Functions include surveillance and identification, aircraft control and force marshaling, and a communications network with sufficient data link capability to support air operations and the air command structure in time of war or national emergency.

Primary equipment includes a tactical mobile radar (maximum power output of 2. megawatts MW), a troposcatter radio terminal set, a satellite communications terminal, and an operations module. The 1 ACS also uses various HF, VHF, and UHF radio sets, auxiliary support equipment, and numerous vehicles and mobile generators necessary for mobility and self-sustainability.

The unit has an authorized strength of 118 enlisted personnel and 12 officers. Thirty work full-time, and 1 are traditional guardsmen who train one weekend per month, plus an additional 1 days of annual training per year.

2.2.2.11.1.1 154th Air Control Squadron Training Area

The 1 ACS trains for 3 or days (2 hours a day) from one to three times per year at a 2-hectare (ha) (-acre ac) site off the beach ust north of the Nohili Ditch and south of KTF. This field training exercise involves moving, setting-up, operating, and packing the unit s equipment practicing site security to defend the site operating in a simulated chemical, biological, or nuclear environment 2 -hour around-the-clock operations using radar, radios, and power-generating equipment and coping with simulated events, such as medical emergencies, fuel spills, fires, and inclement weather. Guardsmen are bivouacked in tents for the duration of the training period. Portable toilets are provided by a contractor.

2.2.2.11.2 National Institute of Standards and Technology

The National Institute of Standards and Technology, Hawaii Radio Station WWVH, a U.S. Department of Commerce facility continuously broadcasts time signals and public service announcements, primarily for the Pacific Basin.

The radio frequency signals are amplified through high-power transmitters and fed to the antenna fields for the four HF antennas, including oneomni-directional antenna and three directional array antennas. Station WWVH transmits on frequencies of 2. , . , 1 . , and 1 . megahertz (MHz) with output powers of kilowatts (kW) for the 2. MHz and 1 kW for the other frequencies.

2.2.2.11.3 Naval Undersea Warfare Center

NUWC Detachment Hawaii maintains an Intermediate Maintenance Activity at PMRF for the mobile anti-submarine warfare underwater torpedo targets used onPMRF s Underwater Tracking Ranges. The torpedo target is a mobile submarine simulator that performs pre-programmable functions of three-dimensional maneuvers ~~at multiple speeds of . to 1 km per hour (3 to 22 knots) in depths of 1 .2 to . m (to 2, ft),~~ for the anti-submarine warfare exercises described in section 2.2.1. . .

The NUWC provides torpedo target operations and maintenance. Over the last five fiscal years, an average of 3 torpedo targets have been prepared for exercises per year, while an average of 232 per year have been launched. For the last three fiscal years for which data has been collated, an average of 3 percent of the torpedo targets are WRB-launched and percent helicopter-launched. An average of percent are recovered by WRB and 3 percent recovered by helicopter.

A PMRF support contractor transports the targets between the NUWC facilities and the mission launch and recovery platforms using the boats at Port Allen or the helicopter landing pads in the vicinity of the Red Label Area.

2.2.2.11.4 Kauai Test Facility

KTF is part of the DOE test complex that supports weapons research and development activities in the Hawaiian Islands. It is managed by the DOE Albuquerque OperationsOffie and is operated by SNL. KTF provides launchers and support functions, and a VHF radio repeater site.

The Kokole Point supplemental LC has a universal (. K) rail launcher and was installed in 1 8 to increase the available launch azimuths for small rockets launched by KTF. VHF radio repeaters support KTF launches.

Over the last 1 years, KTF has had an average of four rocket launches per year. Personnel, normally 13, increase to approximately 1 onsite during a launch.

See section 3.1.1. for a description of the facilities and launch and ground hazard areas associated with missile launch activities.

2.2.2.11.5 Kauai Educational Association of Science and Astronomy Laboratory

The Kauai Educational Association of Science and Astronomy (KEASA) Laboratory operates an amateur celestial observatory that houses a CELESTRON tracking telescope and a home-made telescope for use by the members and guests. The association has approximately 12 permanent members who can use the facility for celestial observations at any time. Typically to guests show up at the laboratory for observations on the Saturdays closest to the new moon. The laboratory has a restroom, but no kitchen facilities.

2.2.2.11.6 Dynasonde Array

The Dynasonde array consists of an HF-band radar antenna array operated by the Laboratory of Atmosphere and Space Physics of the University of Colorado and used for basic atmospheric science research. Operating on a single frequency, the radar emits energy directly up toward the ionosphere and is used to obtain data used for modeling the electron density of the ionosphere. The radar is only used intermittently, usually as part of a wider effort on basic atmospheric research that typically involves other radars and sensors in Hawaii. No Laboratory personnel are stationed at PMRF.

2.2.2.12 Ongoing Maintenance and Operations

Base operations consist of the ongoing operation, maintenance, and upgrade of PMRF s facilities themselves, including tenant facilities, family housing, guest quarters, utilities, and transportation infrastructure (air, ground, and marine), as well as hazardous materials and hazardous waste management.

2.2.2.12.1 Utilities

The PMRF Public Works Office maintains Base facilities and oversees the facility s environmental program. Ongoing operations and maintenance activities involve potable water supply, wastewater treatment, solid waste disposal/recycling, electrical supply, and propane gas supply. Chapter 3 provides specific details and the utility system s operational characteristics.

2.2.2.12.2 Transportation

The transportation infrastructure is provided by the PMRF airfield (see section 2.2.2.), the Port Allen Marine Facility (see section 2.2.2.), and through local roads on the Island of Kauai as described in chapter 3.

2.2.2.12.3 Recreation

To facilitate public access on PMRF, the coastline has been divided into three recreational areas. Except when closed for hazardous operations, recreation area 1 is open Monday through Friday from : p.m. to : a.m. recreation area 2 is open from : p.m. to : a.m. and recreation area 3 is open 2 hours a day. All three recreation areas are open 2 hours a day on weekends and holidays. Chapter 3 provides more details on the use of these recreational areas.

2.2.2.12.4 Hazardous Materials and Hazardous Waste Management

Hazardous materials and hazardous waste management activities at PMRF are governed by specific environmental regulations. PMRF has established management procedures to implement these regulations. Chapter 3 provides more details on the management of these substances.

Transportation of hazardous materials is regulated by the Federal DOT and guidelines from CFR.

Hazardous materials on PMRF are managed by the operations and maintenance contractor. Typical materials used on the installation and stored at this location include cleaning agents, solvents, and lubricating oils. The *Hazardous Waste Management Plan* (1), prepared by the operations and maintenance contractor, identifies requirements for safe storage and segregation of hazardous material, proper safety equipment, spill or accident reporting procedures, and personnel training. (Pacific Missile Range Facility, 1 , Oct, p.1 through 22) 81

Hazardous waste disposal at PMRF operates under Resource Conservation and Recovery Act (RCRA). PMRF accumulates hazardous wastes for less than days and disposes of them through the Defense Reutilization and Marketing Office (DRMO) at Pearl Harbor. Other management programs are in place for the Installation Restoration Program (IRP), underground storage tanks (USTs), asbestos, pesticides, polychlorinatedbiphenyls (PCBs) management, radon, medical/biohazardous waste management, ordnance, lead-based paint management, radioactive materials, and electromagnetic radiation. These management programs are described in detail in chapter 3, in both the Hazardous Materials and Hazardous Waste and Health and Safety sections.

2.2.3 CANDIDATE SITES— NO-ACTION ALTERNATIVE

2.2.3.1 Tern Island

The Navy has no current activities on Tern Island, andsince Tern Island is no longer part of the Proposed Action, No-action information and analysis of Tern Island are not pertinent to decisions being supported by this document. However, the verbiage will be maintained for the purpose of clarity. French Frigate Shoals is a part of the Hawaiian Islands National Wildlife Refuge (HINWR) that includes the islands and atolls from Pearl and Hermes Reef toNihoa Island. The U.S. Fish and Wildlife Service (USFWS) asserts sole urisdiction and control of Tern Island in French Frigate Shoals as part ofthe HINWR (Bureau of Sports

Fisheries and Wildlife and U.S. Coast Guard Corps Agreements, 1), set aside for refuge purposes by EO 1 1 , dated 3 February 1 . 2 3

Although PMRF does not currently use Tern Island, French Frigate Shoals, many other agencies do. The two main agencies are the USFWS and the National Marine Fisheries Service (NMFS). The USFWS maintains a staff all year on Tern Island. The NMFS presence tends to be seasonal, usually from May through September, with occasional visits during the winter (up to 1 month in duration).

The presence of the USFWS on Tern Island, serves as a monitor for the health and condition of the populations of seabirds, endangered Hawaiian monk seals, threatened Hawaiian green sea turtles, and all other wildlife occurring in and around the refuge. The USFWS staff at Tern Island conducts long-term studies on the seabird populations on Tern Island. This includes reproductive success studies for five different species, regularly scheduled nest surveys for 1 different species (including all islands of the atoll), and an intensive mark and recapture study for two species of albatross. The USFWS also monitors the nesting activity of the threatened Hawaiian green sea turtle on two islands of the atoll. Other regular activities include surveys for shorebirds, collection and cataloguing of marine debris, and removal of exotic plants. The USFWS also conducts routine searches for entangled or entrapped wildlife. When media production organizations visit Tern Island,they are supervised by the refuge staff. The USFWS also maintains the facility on Tern Island. (Poetter, 1 8, Feb, p.1)

The NMFS staff monitors the Hawaiian monk seal population at French Frigate Shoals. This includes determining the number and dates of births, tagging weaned pups and unidentified immature seals, conducting beach counts, identifying all marked individuals, releasing entangled seals, identifying and removing entrapment hazards, and documenting in uries. The NMFS is also involved in other research with monk seals, including satellite tracking of adult male seals and deploying underwater cameras (Critter-cams). The NMFS, in cooperation with National Oceanic and Atmospheric Administration (NOAA), also conducts coral reef, fish, and derelict fish net surveys and habitat evaluations. (Poetter, 1 8, Feb, p.1)

The USFWS maintains a staff of two permanent managers and a small staff of volunteers. The average USFWS staff is four, with a range of three to eight. The average NMFS staff is three, with a range of two to six. The highest staffing occurs during the summer months and early winter.

During the summer, the USFWS generally has a media production organization visit French Frigate Shoals. The average size of a crew is three. Some of these organizations include National Geographic, Pacific Adventures, NHK, Inc., and the British Broadcasting Company.

Tern Island is supported by both airplane and seagoing vessels. There are approximately 18 flights and 18 vessel visits within a calendar year. Consideration for the use of plane or ship-based support depends on seasonal activities of wildlife. Many of these flights directly support the recovery of the endangered Hawaiian monk seal and the threatened Hawaiian green sea turtle. The vessels supporting Tern Island anchor 3.2 km (1. mi) southeast of the island, and supplies and personnel are shuttled with .2-m (1 -ft) Boston Whalers. (Poetter, 1 8, Feb, p.2)

2.2.3.2 Johnston Island

The Navy has no current activities on Johnston Atoll, and since Johnston Atoll is no longer part of the Proposed Action, No-action information and analysis of Johnston Atoll are not pertinent to decisions being supported by this document. However, the verbiage will be maintained for the purpose of clarity. Because of its isolation and strategic military location in the central Pacific Ocean (approximately 1,2 km 8 nmi southwest of PMRF on Kauai), Johnston Island (part of the Johnston Atoll) has been and continues to be used for a wide variety of activities by different agencies. Johnston Island is currently used by the U.S. Army, as a subtenant of the Defense Special Weapons Agency that provides base operating support services for the atoll s real property owner, the U.S. Air Force, to store and dispose of chemical munitions temporarily. The Johnston Atoll Chemical Agent Disposal System (JACADS) disposal technology involves disassembly of the chemical-agent-filled munitions and uses four separate incinerators for the destruction process. Each munition type is disassembled by machinery designed uniquely for it, and the chemical agents are drained from the munitions and incinerated in a special furnace designed for agent destruction. Explosives and propellants are destroyed in a separate deactivation furnace. Metal (such as from the munition bodies) that has been in contact with chemical agents is decontaminated in the metal parts furnace. A dunnage incinerator is used to burn combustible wastes. A pollution abatement system for each furnace or incinerator is used to control atmospheric emissions. (U.S. Department of the Army, 1 , p.1-2) 1

The Air Force intends to excess Johnston Atoll at the earliest opportunity. Installation Restoration Program activities are scheduled to be completed by the end of F only long-term monitoring activities will still be required. Possible recipients of the land, once excessed, are another DOD service and USFWS early indications are that the USFWS would probably become the next landowner and may develop a wildlife refuge.

2.2.3.2.1 North, East, and Sand Islands

The USFWS maintains a presence on the atoll throughout the year and continuously monitors the size, breeding phenology, and reproductive success of seabird populations, and bands chicks and adults of some species. With funding from the JACADS Program, research workers have also been monitoring these populations since 1 83 and conducting research (e.g., diet, provisioning rate, energetics, survival, nest site selection, nest site fidelity, reproductive success, and breeding phenology). Research workers typically visit the atoll 2 to times per year and stay 1 to 3 weeks each visit, working on all islands of the atoll. Also with funding from JACADS and the Air Force, academic groups have been conducting research on various aspects of the reef and atoll environment since 1 83 (e.g., coral studies, contaminants sampling in fish and sediments, bioacoustics, reef fish reproduction, and oceanography). They generally visit Johnston every year or every other year and stay for as long as months, usually during the spring and summer. They dive all around the atoll, both inside the lagoon and along the outer reef. (Poetter, 1 8, p.1) 2

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2.3 PROPOSED ACTION ALTERNATIVE

This alternative would include all components of the No-action Alternative described above. Existing range and land-based operations and training, and the ongoing maintenance of the technical and logistical facilities would continue. In this context, addition of the TBMD program would represent a small incremental change in ongoing activities, although the area used would be increased, with longer engagement distances, higher altitudes, and longer-range targets.

Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island and Johnston Atoll are no longer reasonable alternatives takes precedence over these other discussions concerning Tern Island and Johnston Atoll in this EIS.

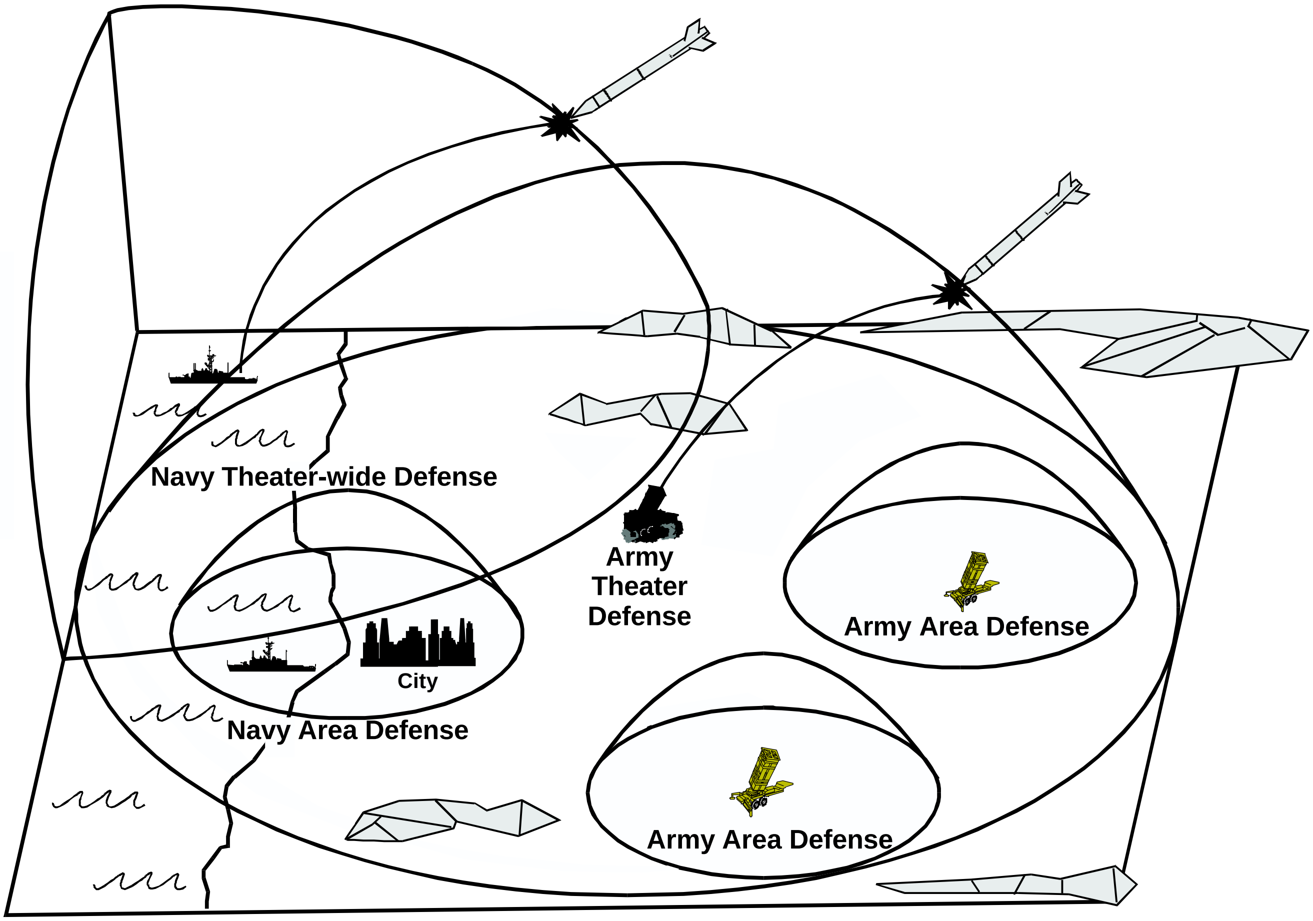
In addition, the Proposed Action would include enhancing the capability of the PMRF to accommodate the developmental and operational testing and training associated with the Navy TBMD program a layered defense system that consists of an upper tier (Theater Wide) and a lower tier (Area). PMRF would also be able to support TMD testing by other DOD agencies.

This concept of multiple tiers or layers of interceptors and the relationship between the Navy TBMD programs and the overall TMD program is illustrated in figure 2.3-1. The upper tier intercepts typically occur at altitudes greater than 1 km (2mi), while the lower tier component intercepts targets at altitudes of less than 1 km (2mi).

The first stage, and priority, of the Navy in TMD is the rapid fielding of the Navy Area capability as a baseline. The Navy has been working to develop a sea-based area defense capability that builds on the existing AEGIS/Standard Missile (SM) air defense system. This effort focuses on modifying the AEGIS combat system to extend its anti-air warfare capability to enable detection, tracking, and engagement of incoming missiles.

The Area defense systems would intercept missiles that penetrate the upper tier and those short-range, low altitude ballistic missiles that canunderfly the upper tier. The AEGIS system would also continue to provide defense against cruise missiles and aircraft (Ballistic Missile Defense Organization, 1 , Mar, p.1).

The Theater-Wide system would be designed to engage missiles at long-range and high altitude (outside the atmosphere) and to protect a very large area (theater). This capability is especially important if the attacking missile is carrying a nuclear, chemical, or biological warhead. The Theater-Wide program would provide vital political and military assets,



Source: Ballistic Missile Defense Organization, 1 , Mar, p.1.

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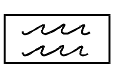
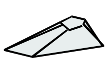
EXPLANATION



Ocean



Mountain

Theater Ballistic Missile Defense In-Depth: Relationship Between Navy Theater-wide and Navy Area Defense, and Army Theater (THAAD) and Area (PAC-3/MEADS) Defense

Figure 2.3-1

Not to Scale

paa relationship 1

supporting infrastructures, population centers, and entire geographic regions with timely and extensive protection against medium/long range Theater Ballistic Missiles. Operating in international waters, forward deployed ships equipped with the Navy Theater-Wide TBMD system would have the capability to engage Theater Ballistic Missiles early in their ballistic missile tra ectory. Multiple ships operating in mutual support would be capable of providing the layered defense and overlapping coverage that lead to improved levels of protection. The Theater-Wide program is not sufficiently developed at this point to evaluate in this document. At such time as the Theater-Wide program is more finally defined, additional analysis under NEPA may be needed. However, AEGIS LEAP intercept (ALI) tests are designed to assess interceptor missile operations outside of the atmosphere, and these tests are well enough defined to be analyzed within this EIS.

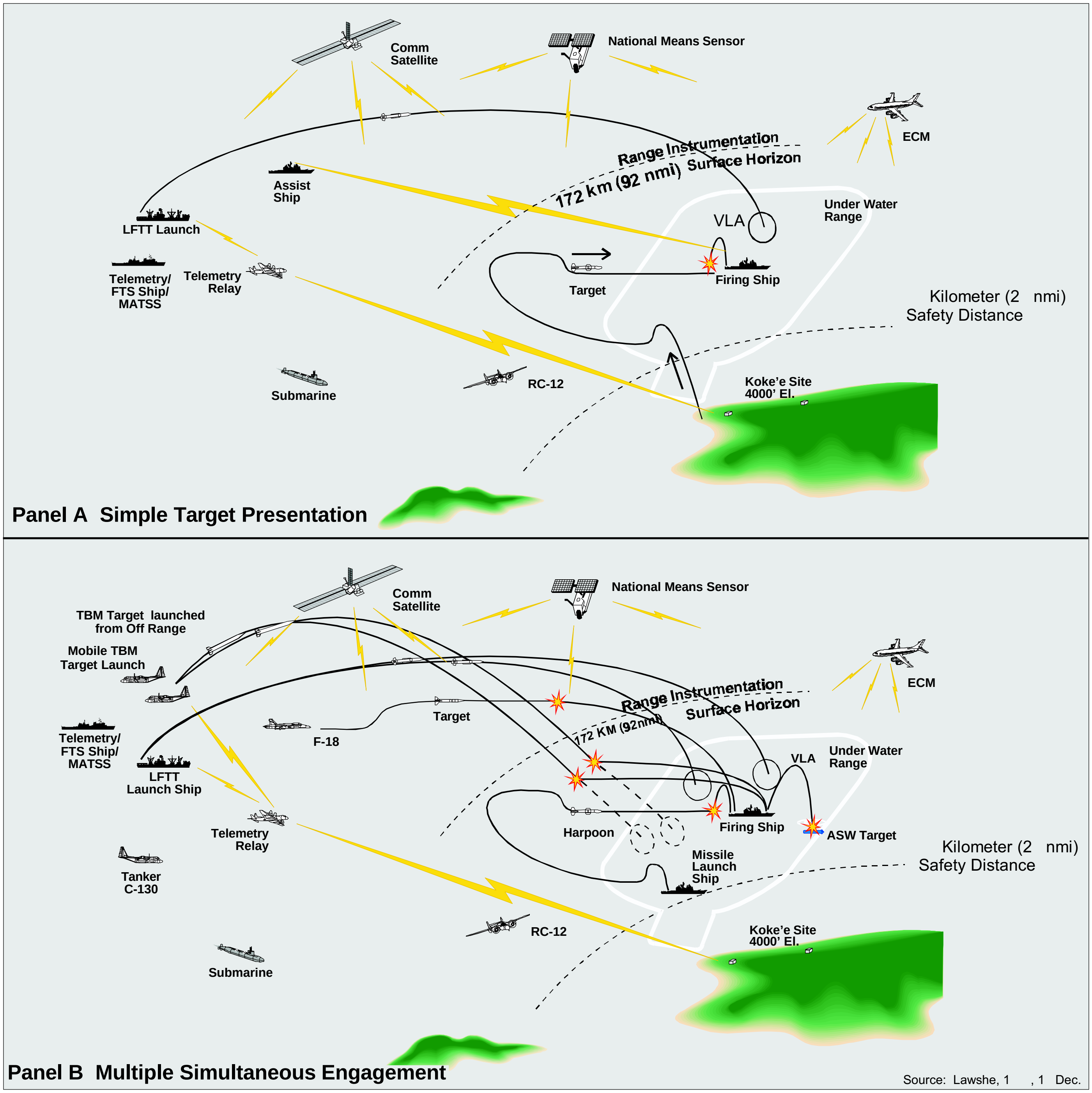
In working to provide active defenses against ballistic missile attacks and a technology base that will allow the Navy and DOD to defend against increasingly sophisticated missiles around the world, the principal range challenge is to provide threat-representative targets that can simulate realistic threats in all warfare areas. Testing of these weapons requires an instrumented range that covers a vast geographic area, capable of high telemetry data rates and simultaneous precision tracking of multiple participants or units. Testing will require a higher degree of precise scenario control and integration than has ever been attempted in at-sea testing. This requirement is driven by the need to coordinate and simultaneously track and intercept multiple threat targets.

Expanded range safety coverage is required to satisfy range safety constraints associated with longer-range weapons and targets. Scenarios may require intercepts at distances of up to 1,2 km (8 nmi) for the Navy Area program.

These testing opportunities, described in more detail in section 2.3. .1.1, would range from fairly simple one- or two-target presentations to an AEGIS ship, (panel A, figure 2.3-2) in the early stages of the program, to much more complex, multiple and simultaneous engagements in the later stages of the program (panel B, figure 2.3-2).

Implementation of the Proposed Action would involve upgrading existing, and/or installing new tracking sensors, data receiving sensors, telemetry, and communications facilities transmitting among the range, ship, aircraft, and missiles, and the construction of new target missile launch facilities. PMRF would be the focal point for the developmental and operational testing and training, but these activities could require a variety of support sites within a radius of 1,2 km (8 nmi) of PMRF as shown in figure 2.3-3. Navy Area TBMD missile test and evaluation flights would take advantage of this enhanced range capability. The mobile sea-based and aerial platform-based target systems, described in section 2.3.1.3, could be located anywhere within the Ocean Launch Area.

A stationary altitude reservation (ALTRV), defined by the individual test scenario, would be required to accommodate the Proposed Action anywhere within the Temporary Operating Area identified in figure 2.3- . ALTRV procedures would be used as authorization by the Central Altitude Reservation Function, an air traffic service facility, or appropriate ARTCC, for use of this airspace under prescribed conditions. A stationary



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EXPLANATION

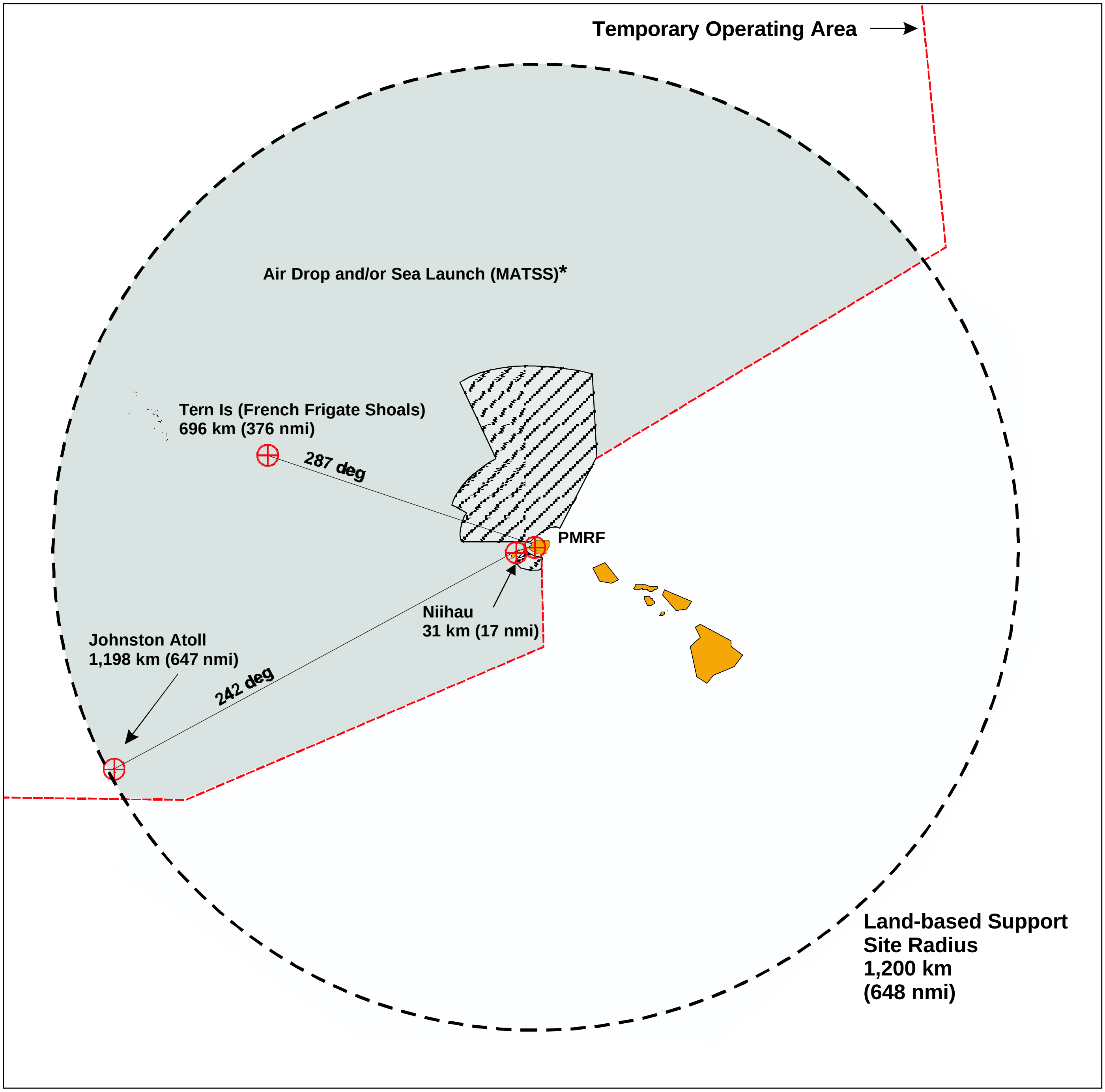
ASA	Anti-Submarine Warfare
ECM	Electronic Countermeasure
FTS	Flight Termination System
LFTT	Low Fidelity Test Targets
MATSS	Mobile Aerial Target Support System
nmi	Nautical Miles
TBM	Theater Ballistic Missile
VLA	Vertical Launched Torpedo

Representative Testing Scenarios

Open Ocean

Figure 2.3-2

Not to Scale



EXPLANATION

	Azimuth	Distance from PMRF (km/nmi)
Johnston Atoll	2 2 degrees	1,1 8/
Tern Island	28 degrees	/3

km kilometers
MATSS Mobile Aerial Target Support System
nmi nautical miles
PMRF Pacific Missile Range Facility

Note: Could operate anywhere within the ocean launch area

Ocean Launch Area
Existing Warning Area

NORTH

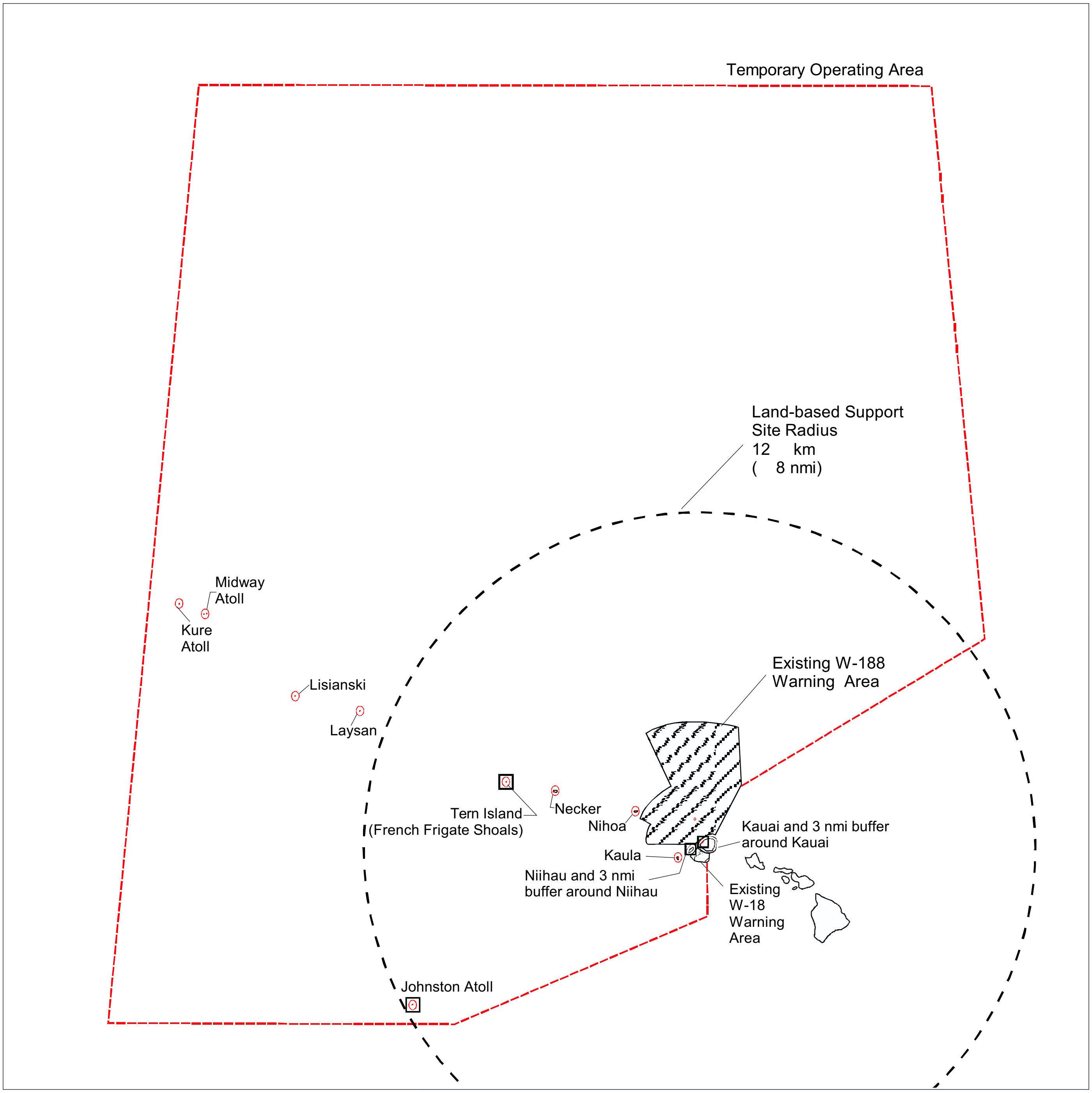
Scale
188 3 Kilometers
82 1 3 Nautical Miles

Proposed Pacific Missile Range Facility Enhanced Capability Support Locations

Open Ocean

Figure 2.3-3

paa support 1



EXPLANATION

Island

Potential Land-based Sites

Existing Warning Area

km kilometers
nmi nautical miles

NORTH

Scale
2 3 2 Kilometers
1 2 283 Nautical Miles

Temporary Operating Area

Open Ocean

Figure 2.3-4

ALTRV defines the fixed airspace area to be occupied as well as the specific altitude(s) and time period(s) the area would be in use. Air traffic control provides separation between aircraft and the proposed activity for the duration of the ALTRV or to the point where the ALTRV ends. The size of the area is determined by the requirement to contain all intercept debris within the ALTRV boundaries. Debris impacts to the islands shown in figure 2.3- would be avoided.

For the Navy Area TBMD program, the tests would consist of multiple simultaneous TBM target presentations, multiple simultaneous anti-ship cruise missile presentations, multi-axis attack, and multi-axis electronic countermeasures scenarios. Many of these tests would be conducted in the littoral (near-shore) environment. These tests would help simulate the integrated multi-warfare testing conditions that the Navy TBMD Program needs specifically, co-located land-based, sea-based, and air-based threats. The activities necessary to implement the Proposed Action detailed below would take advantage of the littoral environment.

After the developmental testing phase, training tests would be conducted as the Area defensive TBM missiles are introduced into the fleet. The intensity of testing is not expected to exceed 1 flight tests per month against various targets or 1 flight tests per month against anti-ship cruise missiles or their surrogates. Training tests would begin in F 2. These numbers represent the realistic upper limits of testing frequency for purposes of analyzing potential impacts however, the actual number of tests is estimated to be much lower.

For the purpose of this document, a test event is defined as either a target missile flight, a defensive missile flight, or a defensive missile intercept of a target missile. Some test events proposed for later in the program would require multiple target and/or defensive missile flights to validate specific missile system performance.

The following sections describe the Navy Area TBMD components. These include the target and defensive missile systems, and sensor systems. The actual developmental and operational testing and fleet training missile operations are described, together with the electronic warfare operations that would be conducted to simulate the multi-axis electronic countermeasures environment. The associated land-based operations and training activities, including target missile launch operations, sensor-instrumentation operations, and communications are described, followed by a description of the additional base operations and maintenance activities that would be necessary to implement the Proposed Action, including the upgrade and construction of new facilities.

2.3.1 TARGET MISSILE SYSTEMS— PROPOSED ACTION ALTERNATIVE

2.3.1.1 Target Missiles

Targets emulate the expected threat and are realistic in physical size and performance characteristics. Targets include ballistic target vehicles and maneuvering target vehicles and may be launched from fixed ground locations, mobile launch platforms, aerial platforms, or sea-based platforms

.

Target systems for TBMD testing would include existing or new target systems. A typical target missile would consist of a booster system, guidance and control electronics, and payload/front end. The target missile would either deliver the payload by itself or with a booster attached. The maneuvering launch vehicle would also have stabilizer fins and cold-gas (nitrogen) thrusters to control roll, pitch, and yaw during final flight.

Target missile launch vehicles may include single- and multi-stage solid or liquid propellant boosters. Representative target systems are given in table A- , appendix A.

2.3.1.2 Target Missile Payloads

Target missiles could house optical sensors, guidance and control electronics, radio transmitters and receivers, a power supply (possibly including lithium, nickel-cadmium, or other type of batteries), or a payload section for simulated biological or chemical munitions, packaged either in bulk or submunitions.

The purpose of using simulants in TBMD launch vehicles is to assess the effectiveness of TBMD defensive missiles against threat missiles carrying chemical and biological agents as payloads. To adequately emulate this threat in testing, it is necessary to use materials that are similar to the physical characteristics of actual chemical and biological agents, but without the toxic effects. Use of actual chemical and biological agents in testing would present the potential for unacceptable hazards, thus the need for simulants.

The only proposed chemical simulant that would be carried in some launch vehicles in bulk would be small quantities up to 133 L (3 gal) of triethyl phosphate. Triethyl phosphate is a colorless liquid with a mild odor and is very stable at ordinary temperatures. It has been approved for use in food packaging and is not regulated by the Occupational Safety and Health Administration (OSHA). Submunitions, if used, would most likely contain water. Biological simulants such as diatomaceous earth may also be used. Diatomaceous earth is a light-colored, porous and friable sedimentary rock that is composed of the siliceous shells of diatoms (unicellular aquatic plants of microscopic size). It is often used as a filter and has been adapted to almost all industrial filtration applications. Specific descriptions and analyses of various biological simulants and the properties of triethyl phosphate are also discussed in the TMD Lethality Program Environmental Assessment (EA) (U.S. Army Space and Strategic Defense Command, 1 3, Aug, p.B- through B-2). 12

2.3.1.3 Target System Launch Requirements

The Preferred Alternative includes targets that may be launched from fixed ground-based locations at PMRF, sea-based and aerial platforms over the open ocean, or from mobile ground-based launchers at PMRF and Niihau. ~~either fixed ground locations or mobile platforms, or from an aerial platform~~.

2.3.1.3.1 Fixed Ground-based Target Launch Preparation

Targets and support equipment would be transported by aircraft or DOD/DOT-approved over-the-road common carrier truck from government storage depots or contractor facilities to a port of embarkation. From there, they would be shipped to Kauai by air or surface and transported to PMRF, where they would be placed in secure storage until assembly and launch preparation. Targets would be transported to the proposed remote launch sites by military transport aircraft or barge. Applicable safety regulations would be followed in the transport and handling of hazardous materials.

Liquid target missile propellant consists of a fuel and an oxidizer, and in some cases an initiator component. Examples of these propellants are unsymmetrical dimethyl hydrazine (UDMH) and kerosene as the fuel component, nitrogen tetroxide (NTO) or inhibited red fuming nitric acid (IRFNA) as the oxidizer component and an organic amine as the initiator component. The composition of NTO and IRFNA differ. NTO is the dimer (two molecules existing together) of nitrogen dioxide. IRFNA is primarily nitric acid, a small percentage of hydrofluoric acid, and less than 2 percent nitrogen dioxide. The presence of nitrogen dioxide vapor as a gaseous product makes the two similar. In fact, except for corrosiveness inherent with all acids, the hazardousness of IRFNA is due to the small percentage of NTO it contains. The vaporization rate of NTO is many times faster than that of IRFNA, and thus IRFNA presents a significantly smaller hazard over a longer time, unless neutralized. Therefore, safety requirements of the two oxidizers are similar but somewhat less stringent for IRFNA.

The typical amounts of propellant used would be approximately 21 L (gal) of UDMH and 31 L (83 gal) of IRFNA for a pre-packaged fueled target missile, and 1,83 L (8 gal) of IRFNA and 1, 1 L (2 8 gal) of kerosene fuel (with coal tar distillates)and 3 L (gal) of initiator fuel for a target missile requiring fueling at PMRF. Some UDMH and IRFNA based targets would arrive at PMRF by air with the fuel already loaded into the system. The IRFNA/kerosene based target would be fueled at PMRF and would require storage of approximately ,2 L (1, gal) of IRFNA (thirty 2 8-L -gal drums), 3, L (gal) of kerosene (eighteen 2 8-L -gal drums) and 22 L (gal) of initiator fuel (two 11 -L 3 -gal drums). These fuels would only be temporarily stored at PMRF when required for a launch.

Liquid propellant for target missiles would be transported either in shipping containers or preloaded in the target missiles from various locations on the U.S. mainland for use at PMRF. While these propellant components are routinely transported on the mainland by roadway, the Proposed Action provides three alternatives for transportation from the mainland to PMRF. Mainland transportation involves placing placards on transport vehicles and using drivers trained to transport hazardous materials (e.g., chemicals such as chlorine, ammonia, and liquid propane). In addition to the other requirements stated above, NTO requires trained escorts, whereas IRFNA does not.

All liquid propellants would be transported in DOT-approved containers from their current storage location to a continental United States (CONUS) site of embarkation over the roadway. The IRFNA would be packaged in DOT-approved 2 8-L (-gal) drums contained inside a secondary 322-L (8 -gal)overpack drum. All aspects of transportation would comply with applicable safety regulations.

The first alternative would ship the materials by air directly from the CONUS to the airfield at PMRF or by commercial marine cargo vessels to Pearl Harbor, then by air to the airfield at PMRF. This alternative would require the Navy to obtain DOT waivers to fly the oxidizer either directly from the CONUS or from Hickam Air Force Base (AFB) directly to the airfield on PMRF via cargo aircraft. Air shipment of liquid target missile propellant oxidizer components is preferred. The propellant would then be transported to a temporary storage site on PMRF. Following loading operations and again prior to takeoff, the secondary containment would be monitored to ensure integrity of the primary drum.

The second alternative being considered is to transport the material by landing craft to the beach at PMRF. This alternative could involve either direct shipment by landing craft from the CONUS or Pearl Harbor to PMRF or the shipment by commercial cargo vessel from the CONUS or Pearl Harbor to either Nawiliwili Harbor or Port Allen. If shipment is to Nawiliwili Harbor or Port Allen, the propellant would then be transferred to a landing craft and subsequently shipped to the beach at PMRF. The shipments would occur on non-passenger vessels with placement of the material on the deck of the vessel per DOT regulations. The IRFNA would be off-loaded for temporary storage at PMRF via landing craft at Ma or s Bay.

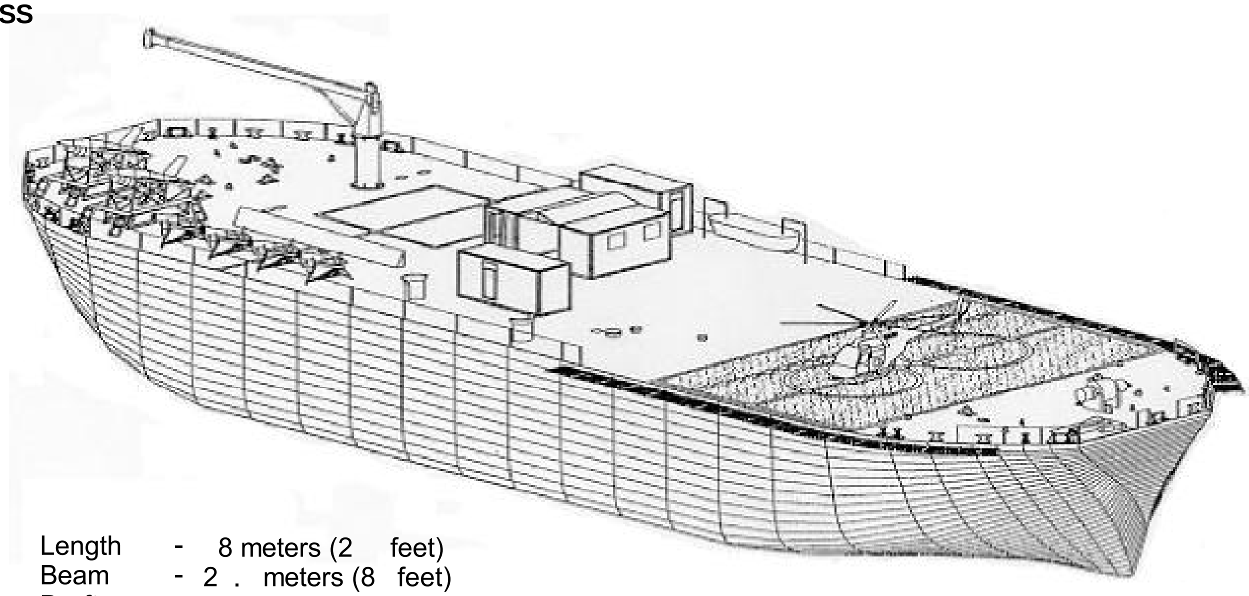
The third alternative would be to ship the propellant from the CONUS or Pearl Harbor to either Nawiliwili Harbor or Port Allen, transfer the propellant to transport vehicles, and continue transportation of the propellant to PMRF over the roadway. Vehicles would include appropriate placards and would be operated by trained drivers. Local fire departments would be notified, and a spill response team would be on standby. Varying the time of day for shipments to minimize any potential exposure of the public would be considered in scheduling shipments by this means.

2.3.1.3.2 Mobile Platform Sea-based Target Launch Preparation

Target launches from mobile platforms would follow the same procedures as described above for fixed ground-based target launches, except that launches would be made from a mobile facility such as the MATSS or the ~~Sea Launch Platform (~~SLP~~)~~. The MATSS would not only act as the launch platform but would also hold recording, communications, and measuring equipment (panel A, figure 2.3.1-1). The MATSS is free-floating and not anchored to the ocean floor during launching. The 8-m (2 -ft long, 2 -m (8 -ft) wide, 2, -tonne (2, -long-ton) displacement MATSS has berthing facilities for 2 people, a full galley, and a control/operations room with a full suite of communications and launch support equipment. It can carry 22, 3 L (, gal) of JP fuel and 12, 2 L (2,8 gal) of diesel fuel. It has a draft of 1. m (ft). It carries its own fresh water, and wastewater would be held in existing ship holding tanks. It would also provide a safe shelter for personnel engaged in the proposed mission.

A small, 1 . -m (32-ft) long airship or aerodynamically shaped balloon may also be used as part of the mobile launch platform. This airship, the Tethered Aerostat System, is a small unmanned airship tethered to the MATSS by three cables and an umbilical cord (figure 2.3.1-2). Its purpose is to extend PMRF s area of operations it would operate at altitudes of up to ,182 m (1 , ft) mean sea level. Like the MATSS, it can carry needed range support systems, such as communications relays, telemetry data collectors, and tracking systems (infrared or optical). Coordination with the FAA for the required .8 km (3-mi) radius Restricted Area in which no aircraft would be permitted from sea level to ,182 m (1 , ft) would be initiated well before implementation of the program.

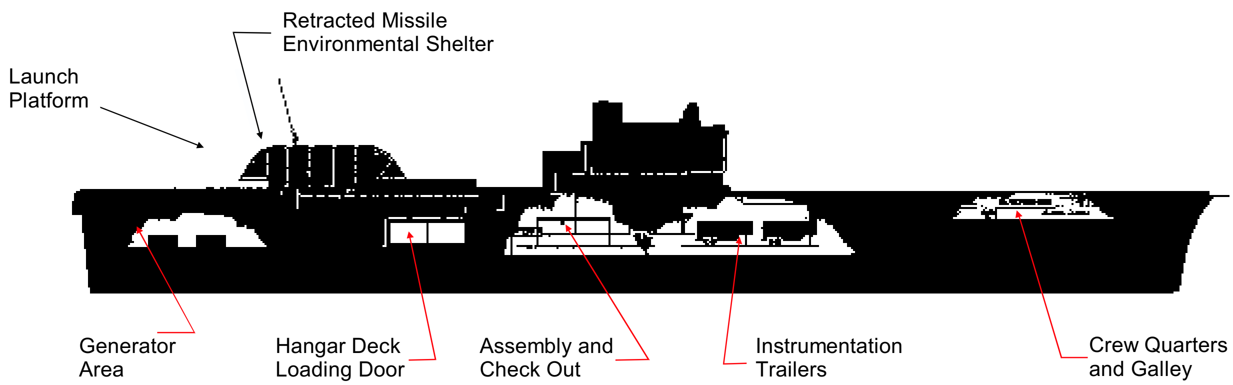
MATSS



Length - 8 meters (2 feet)
Beam - 2 . meters (8 feet)
Draft - 1. meters (feet)
Freeboard - meters (23 feet)

Panel A

SLP



Dimensions - 183. x 31. x . meters (2.3 x 1 . x 31. feet)
Flight Deck - 183. x 31. meters (2.3 x 1 . feet)
Speed - .3 kilometers per hour (knots) (towed)
Displacement - , 8, 8 -1 , , 3 kilograms (11, -18,82 tons)

Panel B

EXPLANATION

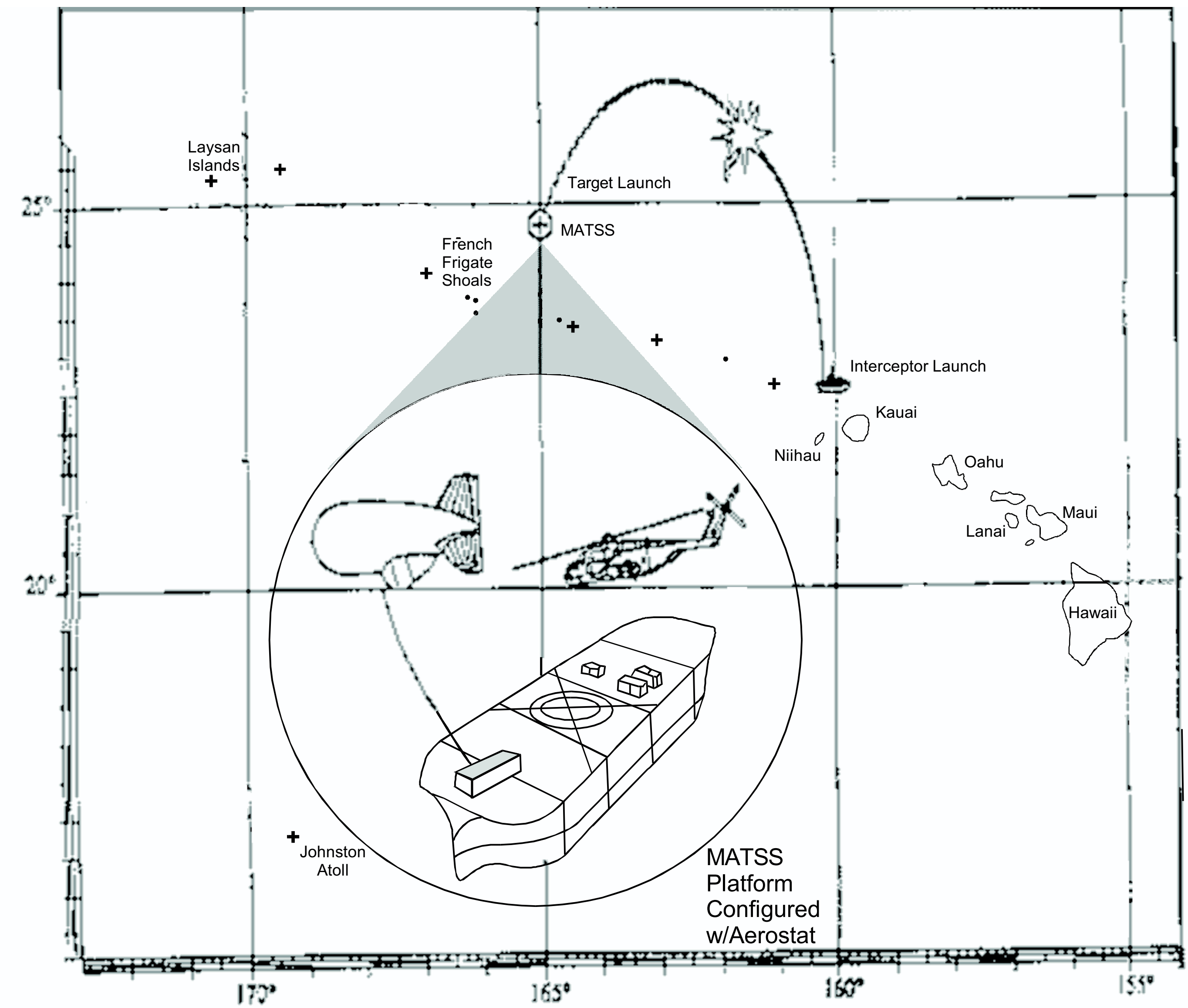
MATSS Mobile Aerial Target Support System
SLP Sea Launch Platform

Representative Mobile Aerial Target Support System and Sea Launch Platform

Not to Scale

Figure 2.3.1-1

paa platform 1



Source: Lawshe, 1 , 1 Dec, p. 1.

50

EXPLANATION

MATSS Mobile Aerial Target Support System

Note: Aerostat not used when MATSS is in a target launch configuration.

Mobile Aerial Target Support System (MATSS)

NORTH

Scale

18 3 Kilometers

1 2 Nautical Miles

Hawaiian Islands

Figure 2.3.1-2

paa matss 1

Use of an SLP was analyzed in the TMD Extended Test Range EIS (U.S. Army Space and Strategic Defense Command, 1). An SLP (panel B, figure 2.3.1-1) would provide the 132
chance to change azimuths and range of target launches. Similar to, but larger than the MATSS, the SLP also is free-floating and not anchored to the ocean floor during launching, ust like the MATSS. (Gonzalez, 1 , 23 Jul). 28

The SLP would be towed and would be stable for target launches in rough seas (up to Sea State). The LPH-1 was selected as the SLP due to a large open and enclosed decks, stability, good onboard living quarters, and easy roll on/roll off capability. The maximum time from port-to-port usage is 21 days carrying up to personnel during operations. The SLP will carry fresh water using both existing ship tanks and bottled drinking water. Wastewater will be held in existing ship holding tanks. There are no plans for helicopter service, but emergency pick-up from hover only can be supported. (Gonzalez, 1 , 23 Jul) 28

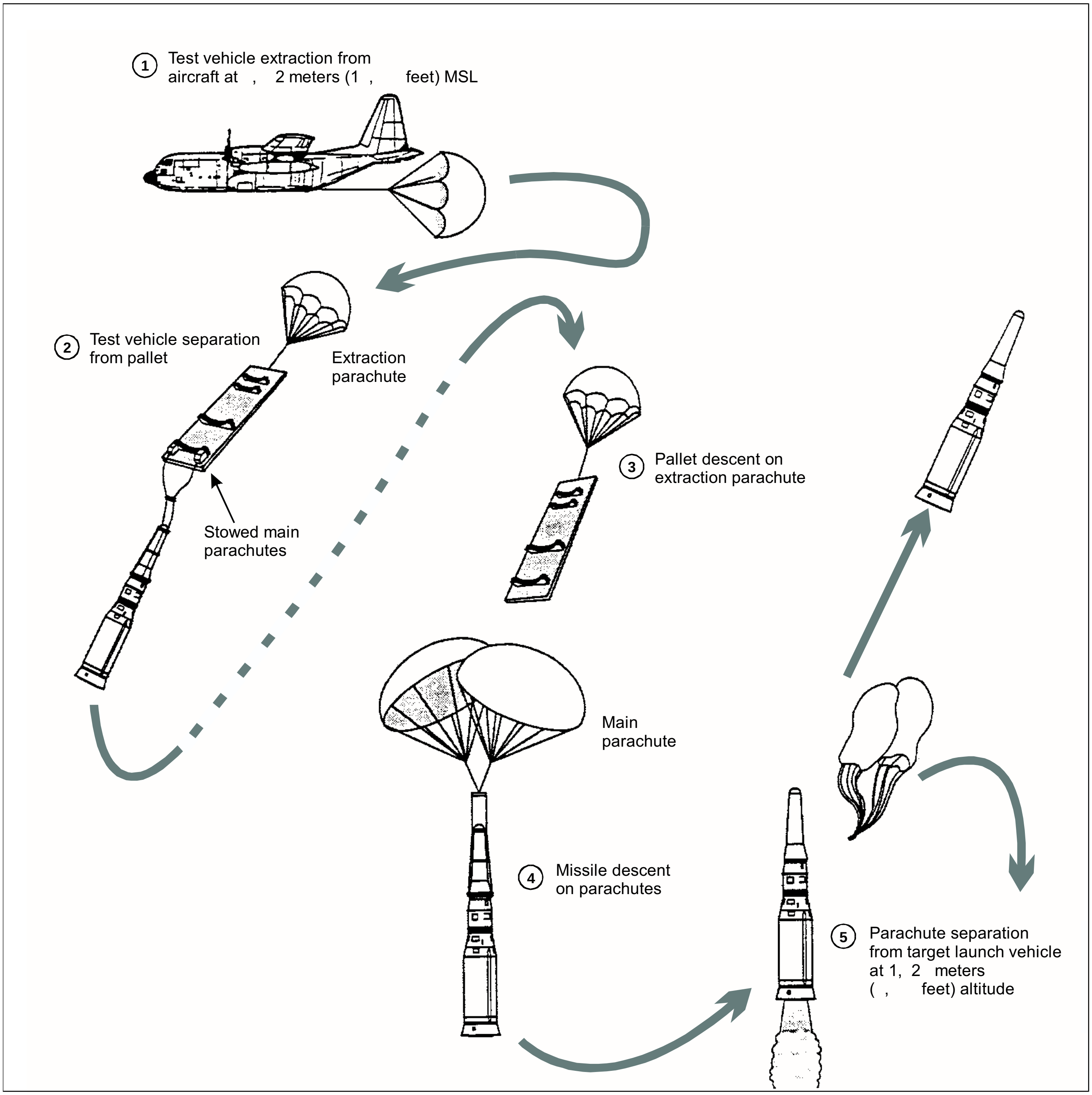
Target missiles would be loaded onto the mobile SLP either at Pearl Harbor or San Diego, California. In the case of liquid propellant target missiles, the missile propellant would be loaded with the missile on its launcher en route to the desired location. The mobile SLP would then proceed to the desired launch position. Operators of the mobile SLP will be trained in emergency response procedures for all target missiles, including spill response procedures for liquid propellant. Storage for liquid propellants and target vehicles would be on Oahu at the Naval Magazine, Lualualei (NAVMAG LLL) magazines.

2.3.1.3.3 Aerial Platform-based Target Launches

Launches of targets would be conducted from specifically configured cargo aircraft (figure 2.3.1-3). The short-range Air Drop would involve the build-up of a target missile on a standard cargo pallet and specialized sled. The target missile could be obtained by modifying an existing Hera or similar target missile (Ballistic Missile Defense Organization, 1 , Mar, p. 1). The integrated target/pallet assembly would be loaded into a C-13 or similar aircraft and flown to a predetermined drop point. The target/pallet assembly would be pulled from the aircraft by parachute and dropped at about , 2 m (1 , ft) above mean sea level. The target would separate from the pallet, then descend via parachutes to approximately 1, 2 m (, ft) above mean sea level. At about 1, 2 m (, ft) above mean sea level, the parachutes would release the target, and motor ignition would occur during free-fall. After firing, the target would follow its flight path to interception or to splash down within a designated ocean impact area. The target would be fitted with an FTS to terminate the flight if unsafe conditions develop. (Ballistic Missile Defense Organization~~U.S. Air Force~~, 1 8~~–~~, ~~Nov~~May, p.2-1) 18

A nominal tra ectory of the launch could provide a range of up to 8 km (3 mi) and an altitude of 22 km (1 mi). (Ballistic Missile Defense Organization~~U.S. Air Force~~, 1 8~~–~~, ~~Nov~~May, p.2-). 18

The pallet and associated expendable parachute hardware would fall into the ocean and sink, and therefore would not be recovered. However, the two main parachutes would be recovered, if possible, from the ocean drop zone.



Conceptual Aerial Target Launch for Air Drop

Figure 2.3.1-3

Not to Scale

The Air Drop target motor would be shipped by air to the target missile integration site from Hill AFB, Utah. Other components, such as the ground control system, aft skirt and fins, and sled-and-pallet assembly, would be shipped to the target missile integration site from other contractor locations. When the solid rocket motor and other components arrive at the target missile integration site, the motor would then be transferred to a missile assembly building for installation of the FTS and integration of the other components. The target vehicle would then be attached to the pallet-and-sled equipment.

A C-13 or similar aircraft supporting the air-launched target would be based at a military airfield within range of the flight test area. Launch preparation would be as described for the ground-based target launches above, and could be accomplished at PMRF, although a CONUS site is currently planned. Approximately 2 to 3 personnel would be required to maintain the air launch program.

2.3.1.3.4 Land-based Target Missile Launch and Flight

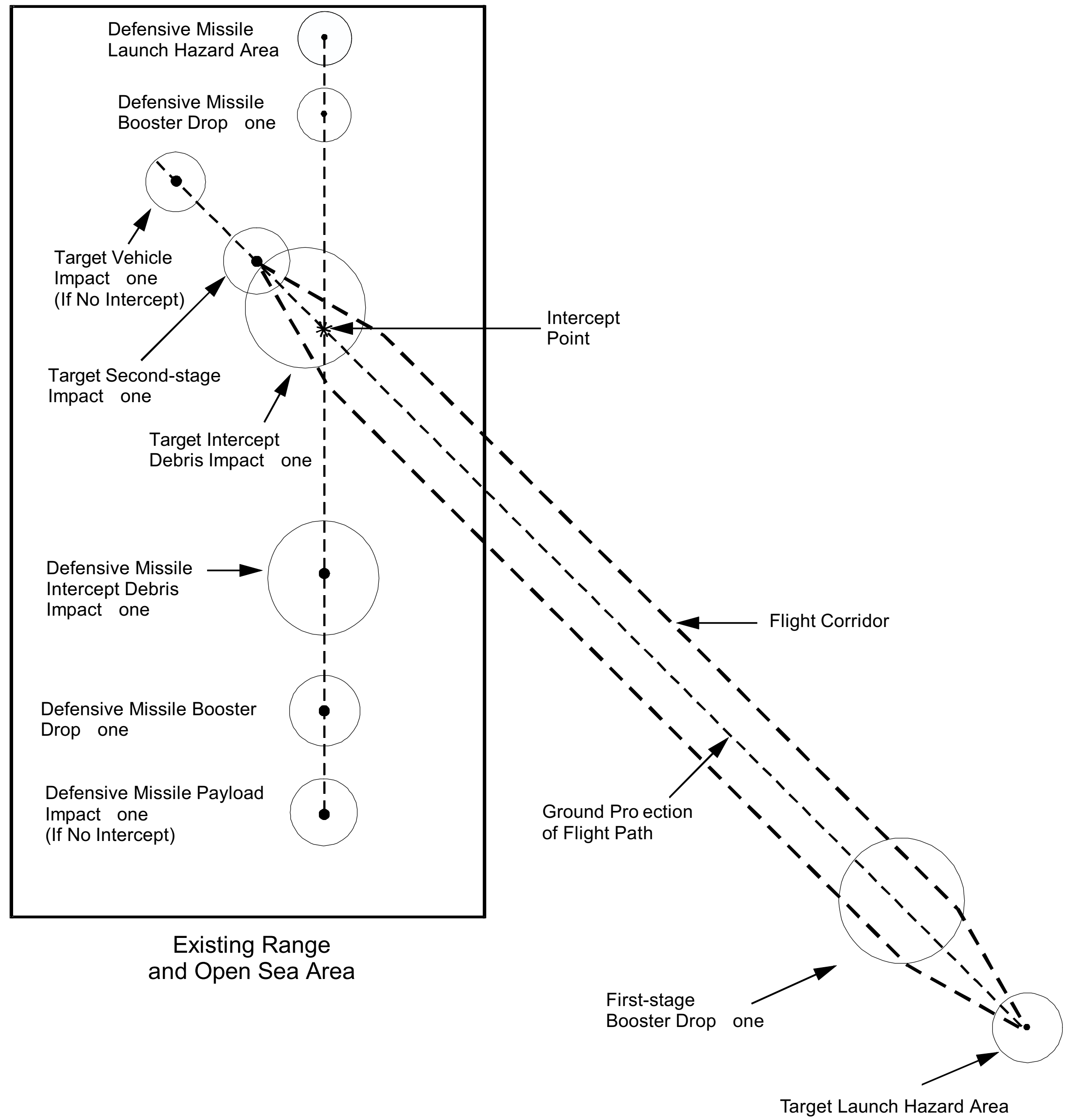
Targets would be launched from fixed or mobile launchers and flown on tra ectories that emulate threat missile flight paths. Tra ectories and range would vary greatly depending on the training exercise scenario.

Intercept debris impact zones, target and defensive missile impact zones (in the event of a missed intercept), and booster impact zones would all be confined to open ocean areas that have been determined clear of ships, vessels, watercraft, etc. Nooverflights of inhabited areas would occur.

A plan diagram (figure 2.3.1-) shows the typical target and defensive missile launch hazard area, booster drop zones, intercept debris impact zones, and intact target vehicle and defensive missile impact zones for air, sea, and land intercept scenarios.

When a missile flight test is planned, there are certain areas where missile components and debris are expected to impact within a prescribed area within the Temporary Operations Area. These are the booster drop zone and the debris impact area. These areas are determined clear of non-participating ships, aircraft, and personnel as part of the test plan. There are other areas where debris may land if the test does not proceed as planned. These predetermined areas of the test event may be sub ect to the risk of mishap, such as an explosion or flight termination. An example of this type of area is the launch hazard area. Clearance areas are defined by the PMRF Range Safety Office to encompass the maximum probable distribution of debris or impact points of missile components.

Each missile flight test event would be modeled using computer predictions of the behavior of the missiles. This modeling predicts what the missile may do in a number of situations where the missile, or parts of the missile, may fall to earth. The models incorporate a number of variables such as the missile mass, velocity, tra ectory, altitude, and descriptions of the environments that may affect the missile in flight such as surface and high altitude winds, precipitation, humidity, etc. The more specific, or correct, the variables are, the more correct the prediction of the missile s behavior can be. Modeling



Source: U.S. Army Space and Strategic Defense Command, 1 , Jan, p.2-1 .

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Representative Impact Zones (Revised)

Figure 2.3.1-4

Not to Scale

paa impact 1

that is done long ahead of the actual test can only assume what the weather conditions would be. Modeling done on the day of test can use actual conditions.

Specific impact zones are defined for each flight test depending upon the profile of that test. The profile includes such variables as the direction, altitude, size of missile, and speed and velocities of winds at all altitudes. These variables are all analyzed using computer models for each test mission to predict where the debris or missile components may land after an intercept or a miss. The modeling also predicts the location and probability of where debris may land in case of mishap or an unplanned event (such as a flight termination). The Range Safety Office would communicate the extent, date, and duration of the required impact zones, once they are defined, to the FAA, the Coast Guard, and local police urisdictions for assistance in determining that the designated land, air, and sea-surface areas are clear of non-participants. Other areas under the flight path, but not in a predicted impact or debris area, would be monitored prior to the test event to determine the location of air and sea traffic. If the Range Safety Office determined that the aircraft or ship traffic was in a safe position, the test would proceed.

Ground and range safety areas are developed to protect the public and private property against potential test mishaps. These safety areas are defined in terms of three scenarios: termination or explosion on the launcher termination of a missile s flight shortly after liftoff within the launch hazard area and termination of a missile s flight after it has left the vicinity of the launch site.

Fire suppression, hazardous materials emergency response, and emergency medical teams would be available during launch operations.

Range safety officials would issue notices (NOTAM and NOTMAR), and the impact areas would be determined clear of both non-participating surface vessels and aircraft before proceeding with a test.

Each target flight test requires collection and analysis of data on the target, the interceptor, and the intercept itself. All exercise and test assets must be tracked in real-time to permit safe conduct of the test event. Tracking data is also required for post-exercise or test reconstruction and analysis. Telemetry receivers, optical sensors, and radar would support both collection and analysis. Data would be transmitted from the target and interceptor to ground stations during flight for recording and analysis. Ground-based optical sensors, radar, and telemetry would be supplemented by ship-based or airborne sensors. Total personnel involved in a typical target flight test launch would be approximately   during the typical 2- to 3-week period.

Ground-based, ship-based, or airborne platforms would provide command and control via a communication uplink with the target and interceptor. One such airborne platform is the Unmanned Aerial Vehicle System (UAVS)   remotely piloted or preprogrammed aircraft. The UAVS, which can fly long distances at high altitudes for long periods of time, would carry useful long range support systems. The UAVS could be used in con unction with Aerostats, which would receive information from the UAVS, and relay the information to PMRF/Main Base. The UAVS would provide radar surveillance over broad ocean areas, relay communications over long distance, and provide photographic or optical support.

2.3.1.3.5 Modification of the Restrictive Easement

For Area TBMD and TMD targets, the nominal ground hazard area for most unguided systems is . m (2, ft). For guided target systems, the ground hazard area ranges from 1,82 to 3, 8 m (, to 1 , ft). Actual ground hazard area dimensions andsafety procedures are determined by the Range Safety Officer for each target flight test. In order to accommodate these ground hazard areas, the U.S. Navy would request the State of Hawaii to modify the existing lease of exclusive easement granted by the State of Hawaii in 1 3 to run through 31 December 2 3 , before the current agreement expires on 31 December 2 2. This modification would enable those target and defensive missile systems that support TBMD and TMD to use the ground hazard area which the easement supports. The total number of times per year that the rights under the easement are utilized (3 times per year) and clearance time per launch (3 minutes) would not change.

2.3.1.4 Target System Facility Requirements

Table A-8, appendix A lists the target launch pad (rail and stool) facility requirements along with the target support and preparation and launch control facilities for the Navy Area TBMD program. Table A- , appendix A lists the target support and preparation and launch control facilities requirements.

2.3.2 DEFENSIVE MISSILE SYSTEMS— PROPOSED ACTION ALTERNATIVE

2.3.2.1 Defensive Missiles

Defensive missiles may include surface-to-air missiles (interceptors) or surface-to-surface (counterforce) missiles. Defensive interceptor missile systems destroy threat missiles and/or reentry vehicles in flight.

The Navy Area (lower tier) system would be based on guidance, propulsion, and warhead upgrades to the SM-2 Block IV missile, which is fitted with an infrared seeker for the precise targeting of the TBM as it reenters the atmosphere. A new dual-processor guidance unit uses target detection software for analysis of targeting signals. The guidance unit consolidates data.

Defensive missiles would be launched from Navy ships or land locations (using such missiles as the Army s PATRIOT missile). PMRF/Main Base (KTF) and Niihau are the only locations for proposed TMD launching of land-based interceptors. These missiles~~and~~ would use single- and multi-stage solid propellant boosters. Solid propellants are composed of three basic components: a fuel element, an oxidizer element, and a binder that holds the fuel and oxidizer together in solid form. Flight test profiles would vary greatly in tra ectory, range, and altitude.

Other DOD defensive missile programs may choose to take advantage of PMRF s enhanced capability. Representative defensive missile systems are given in table A-1 , appendix A.

2.3.2.2 Defensive Missile Payloads

Defensive intercept missile payloads destroy threat missiles and/or re-entry vehicles in flight. The kill mechanism may include direct hit missiles with or without explosive warheads that destroy the target by detonating near it, or kinetic-kill vehicles that destroy the target by colliding with it at high speed. Payloads may separate from the defensive missile prior to target intercept or may remain attached to the booster. Lethalityenhancers may also be employed and may include the use of a fragmented warhead or structural cutters to increase the probability of an intercept (U.S. Army Space and Strategic Defense Command, 1 , Jan, p.2-23). 132

Some defensive missile system payloads may contain an FTS that is separate from the launch vehicle FTS. The purpose of the payload FTS is to destroy or render the payload harmless in the event of a mission failure (such as an off-course flight) (U.S. Army Space and Strategic Defense Command, 1 , Jan, p.2-23). 132

Ground hazard areas and launch hazard areas (over water areas) are established beyond which no debris from an early flight termination is expected to fall. The hazard area is determined by size and flight characteristics of the missile, individual flight profile of each exercise or flight test, and reaction time between recognition of a flight malfunction and decision to terminate flight. For a rail launched missile, debris will stay within the Flight Corridor Azimuth Limits. For a vertical launch, debris will remain within the circular ground hazard area, with the ma ority falling in the direction of the missile flight prior to termination.

Defensive missile system payloads may also contain radar and optical sensors, guidance and control electronics, radio transmitters and receivers, small solid rocket motors for separating payloads from boosters, and power supplies which may include lithium, nickel, cadmium, or other types of batteries. Defensive missile payloads may be equipped with divert and attitude control propulsion systems that control the payload after separation from the launch vehicle. Divert and attitude control systems may use small liquid hypergolic propellant systems or consist of miniature solid-propellant rocket motors (U.S. Army Space and Strategic Defense Command, 1 , Jan, p.2-23). 132

2.3.2.3 Defensive Missile Launch Requirements

2.3.2.3.1 Ship-based Defensive Missiles

The Navy SM (SM-2 BLK IV, IVA, SM-3 and further variants) would be used to support engagements against targets. These SM variants would be launched in the wide-open ocean or littoral areas from AEGIS cruisers or destroyers (figure 2.2.1-8) that are equipped with the Navy s AEGIS Combat System, which uses a vertical launch system.

The AEGIS Combat System was designed as a total weapon system from detection to intercept. The heart of the system is an advanced automatic detect and track, multi-function phased-array radar. This radar is able to perform search, track, and missile guidance functions simultaneously.

2.3.2.3.2 Land-based Defensive Missiles

All of the land-based defensive missiles require a cleared, level, compacted area to set up and operate. Table A-11, appendix A, lists the land-based defensive or interceptor support and preparation facilities requirements for the TMD program.

2.3.3 SENSOR SYSTEMS— PROPOSED ACTION ALTERNATIVE

Sensor systems are used to acquire, record, and process data on targets and defensive missiles in order to detect and track targets, direct defensive missiles, and assess whether a target has been destroyed. Sensor systems are composed of sensor elements and signal processing components.

Sensor elements collect raw data from the target. Technologies used in sensor elements may include, but are not limited to, optical (visual and infrared), acoustic, and radar.

Optical and acoustic sensors are passive sensors that do not emit energy but only measure energy emitted by the target. Radar sensor systems are active sensors that emit energy and measure the reflected energy from the target.

Signal processing components receive the raw data collected by the sensor elements and process it, using computer hardware and software, into usable information such as target location, velocity, and attitude. These and other relevant characteristics can then be used to plan and control intercept engagements.

Sensor systems that may be used in Navy TBMD testing include existing shore-based, ship-based, and aerial sensors used at PMRF (described in sections 2.2.1. and 2.2.1.), including the radar at Kaena Point on Oahu and newly developed (or modified) sensor systems. Some sensors planned for use would be standard range assets, both portable and fixed, routinely used to support missile flight tests. Other airborne sensors, ship-based sensors, and space-based sensors may also be used for surveillance and tracking support.

2.3.3.1 Radar Systems

Modifications to the existing radars at PMRF would be required for implementation of the Proposed Action. Two Coherent Signal Processing (COSIP)radars would be added at suitable existing PMRF radar sites. A third transportable COSIP radar, and a transportable Multiple Ob ect Tracking Radar (MOTR) capable of being transported by ship or aircraft, would be stationed at PMRF when not being used at remote sites. In addition, an -band Imaging Radar would be placed at PMRF. Other existing radars would be upgraded to provide better ob ect tracking and imaging capability.

Radar test locations would be sited and radar operations would be controlled to minimize electromagnetic radiation hazards. Human hazard keep-out zones for the various versions of radar used in TBMD testing would be established. If required, keep-out zones will be posted with warning signs warning lights (beacons) will also be used wherradars are operating.

2.3.3.2 Telemetry Systems

Proposed additional or enhanced resources include upgrades to telemetry systems. This alternative proposes a telemetry system capable of downloading information simultaneously from at least four targets and four interceptors, each of which can have several telemetry links. This requires the addition of new antenna systems large enough to handle extremely high data rate transfers.

Upgrades and modifications would be made to the existing telemetry facilities at PMRF described in section 2.2.1. .3. Mobile surface telemetry options that would be implemented for the Proposed Action include a self-contained system using common commercial off-the-shelf hardware and a multi-task phased-array telemetry antenna system. The systems are transportable in C-1 1 type aircraft or are compatible with surface platforms such as the MATSS and large amphibious ships or cargo ships. The systems would also be compatible with a graded ground-based site (no foundation or paved surface would be required) (U.S. Department of the Navy, Theater Air Defense Program Executive Office, 1 , 3 Dec, p.2 through 28). The telemetry options would be used for mobile target support and off-axis requirements. 1 1

Other telemetry options would include an airborne option using P-3 type aircraft that would be upgraded for high bandwidth capability, telemetry, and communications relay. The P-3 type aircraft could assist in range safety functions and help determine that the test area is clear of nonparticipants.

The GPS provides position accuracy, to approximately 1 m (328 ft) anywhere in the world. The GPS enhances the accuracy and safety of exercises and can be used by many targets. A special version called the DGPS can correct many errors and increase the accuracy to within 1 m (33 ft) to less than 1 m (3 ft), depending on system performance. This alternative proposes use of both systems to support the augmented need for over-the-horizon multiple target control.

Due to the extended range of many of the proposed targets, this alternative proposes development of a Wide Area Defense GPS network capable of tracking targets in flight to satisfy range safety requirements. This capability would eliminate the need to acquire and construct numerous ground tracking radar sites. A Wide Area Defense GPS network would be able to calculate target position at high accuracy over a very large geographical area. The network would include multiple DGPS reference sites in a variety of locations surrounding and within the exercise area. The network would require access to the High Performance Computing Center on Maui, or the University of New Mexico in Albuquerque for post-processing and may involve installing data links at one or more remote sites.

2.3.3.3 Optical Systems

Under the Proposed Action, new optics systems would be used at existing PMRF sites. Optical systems being considered include infrared and visible lightelectro-optic systems with laser ranging capability. The Proposed Action would also require the continued use of the existing Air Force Maui Optical Station (AMOS) facilities on Maui and airborne platforms such as the High Altitude-Large Optics/Infrared Instrumentation System, Advanced Realtime Gaming Universal Simulation, and Airborne Surveillance Test Bed. Existing optical facilities would be selectively upgraded as needed. New ground-based optical systems would be transportable (U.S. Department of the Navy, Theater Air Defense Program Executive Office, 1996, 3 Dec, p.36). 171

Table A-12, appendix A, lists the telemetry, optics, and radar instrumentation requirements for the TMD ~~Area~~ programs.

2.3.3.4 Communication Systems

Communications considerations include the capability to network all of the test and evaluation functions over secure lines, and to provide communications support for range to ship, range to off-range sites, and range to other off-range participants; over-the-horizon communications link nodes; access to National Asset's command and data links; and AEGIS Performance Assessment Network (PAN) support connectivity.

Command and control for Navy TBMD will be provided by the integrated C^4I architecture that links joint-service Theater-wide command, control, communications, computer, and intelligence assets. The C^4I architecture includes fleet combat direction systems, tactical data links, the Navy's cooperative engagement capability (CEC), and fleet and joint-service HF, UHF, VHF, and satellite communications systems. In addition, PMRF's existing capabilities would be selectively upgraded as needed.

Table A-13, appendix A, lists the communications, command, and control requirements for the TMD Area programs.

2.3.3.5 Support Infrastructure Requirements

Table A-14, appendix A, lists the support infrastructure, including facilities, utilities, transportation, and services requirements for the TBMD Area programs.

2.3.4 CONSTRUCTION REQUIREMENTS—PROPOSED ACTION ALTERNATIVE

The following sections identify the individual proposed new target and interceptor launch facility and instrumentation facilities and their sites for the proposed Navy Area TBMD and related DOD TMD locations identified in table 2.3.4-1.

Table 2.3.4–1: ~~Proposed~~ Activities Being Considered at Each Location

	PMRF/Main Base (KTF)	Niihau	~~Tern Island~~	~~Johnston Atoll~~
~~Area~~ Targets	●	●	~~●~~	~~●~~
~~Area~~ Interceptors	●	●		
Instrumentation	●	●	~~●~~	~~●~~

PMRF/Main Base (KTF) and Niihau~~, Tern Island, and Johnston Atoll~~ are being considered for the proposed Area TBMD launching of targets. Both Tern and Johnston Atoll were considered as fall-backs to the preferred mobile platform sea-based target launch and aerial platform-based target launch options identified above in sections 2.3.1.3.2 and 2.3.1.3.3, respectively, but have been eliminated from consideration at this time. PMRF/Main Base (KTF) and Niihau are the only locations for the proposed TMD launching of land-based interceptors or land-based targets. The locations identified in table 2.3.4-1 are being considered for either fixed or mobile instrumentation sites.

In all cases, maximum use of existing facilities is proposed. The generic target system facility requirements identified in section 2.3.1.4 and the generic defensive missile system facility requirements identified in section 2.3.2.3 apply to the specific sites identified below. Specific requirements differing from the generic requirements are noted. Table 2.3.4-2 provides an overview of construction activity by location.

2.3.4.1 Pacific Missile Range Facility/Main Base (Kauai Test Facility)

PMRF/Main Base (KTF) is being proposed as a location for instrumentation and for launching targets and interceptors. Implementation of the Proposed Action would require either the use of existing facilities at KTF, or new, modified, or expanded target and interceptor launch facilities, instrumentation, communications, command, and control, and infrastructure facilities. These proposed actions are identified below, with their locations shown in figures 2.3.4-1 through 2.3.4-3.

2.3.4.1.1 Launch Facilities—Targets

2.3.4.1.1.1 Existing

Site D, the Pad 1 rail launch site, has all the infrastructure and support facilities to launch medium and small size targets and would be used to launch targets. Similarly, Site F, the Pad 41 rail launch site at Kokole Point on the south end of the PMRF, has all the infrastructure and support facilities to launch medium and small size targets.

2.3.4.1.1.2 Modification, Expansion, and Replacement

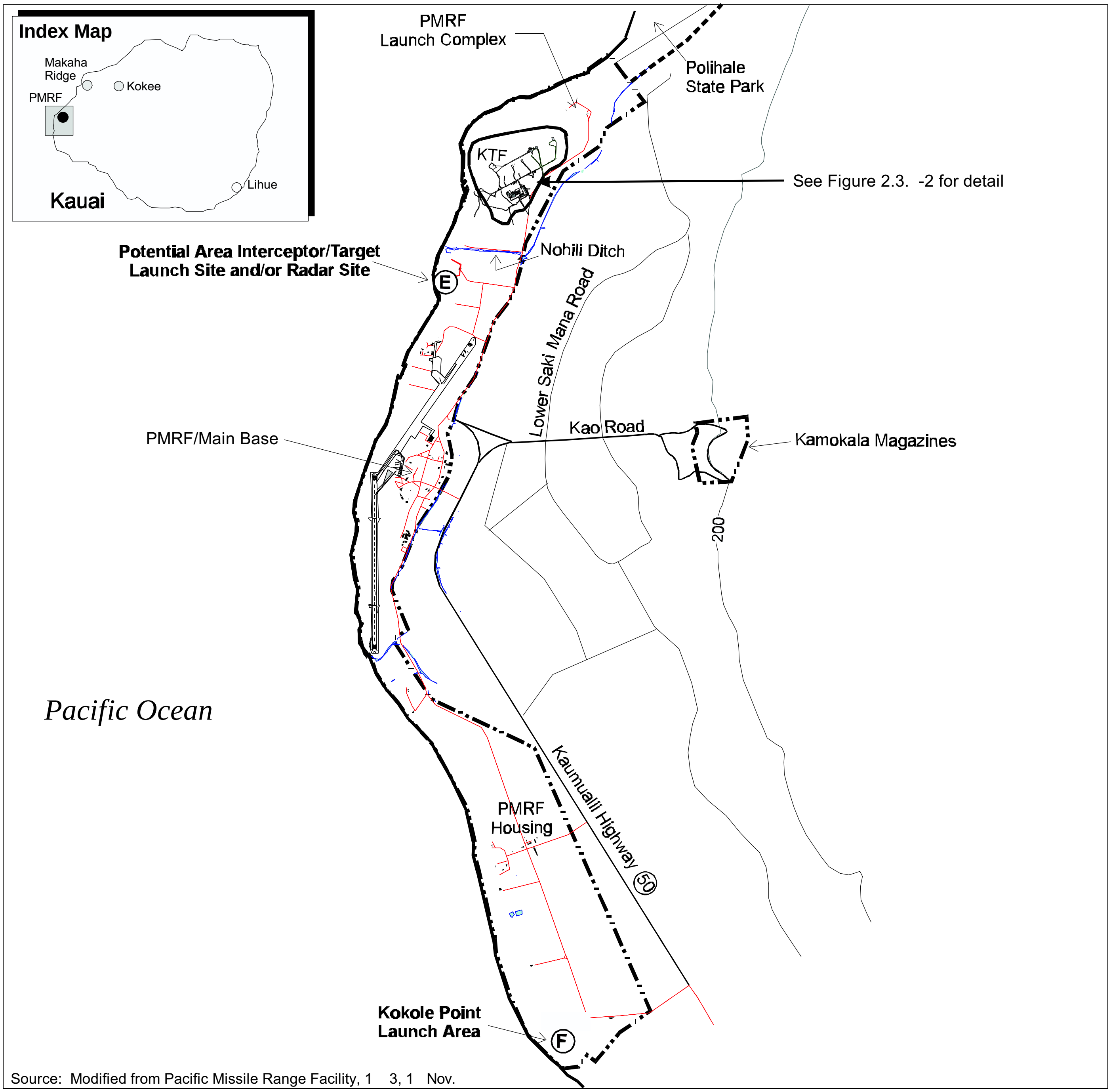
Minimum modifications would be made to the stool and missile service tower of Site A, the Strategic Target System Stool Launch Pad. Site A would support target missiles. Modifications could also be made to the existing Rocket Motor Staging Area, Site H, with the addition of environmental controls for missile assembly and preparation use.

2.3.4.1.1.3 New

Three new potential target launch locations have been identified: Site B, Site C, and Site E, south of Nohili Ditch, which would be a potential site for placement of a mobile target launcher, that requires a 30.5-by-30.5-m (100-by-100-ft) cleared, level, compacted area to set up and operate. The sites must have survey points, and the Range would be

Table 2.3.4–2: Proposed Action Building Modification and Construction Activities

Location	Existing Building Modifications	New Construction
PMRF/Main Base (KTF), Kauai	• Strategic Target System and other existing launch pads • Laboratories and Buildings • Rocket Motor Staging Area	• Target Launch Facility • Interceptor Launch Area • Temporary liquid propellant storage area • Missile Assembly Building
Makaha Ridge, Kauai	• Upgrade existing power plant • Road upgrades • Upgrade building	• COSIP Radar • Mobile COSIP Radar • Telemetry • Optics • Relocation of Helicopter Pad
Kamokala Magazines, Kauai	• None	• Two missile storage buildings and fencing • Road improvements
Kokee, Kauai	• Upgrade existing instrumentation • Upgrade existing building	• MOTR • Mobile COSIP Radar • Instrumentation building • -band Imaging radar • Telemetry receiving antenna(s) • Towers and platforms for communication equipment
Niihau	• None	• Target Launch Facility • Interceptor Launch Area • Telemetry/Instrumentation • Aerostat site (2) • Airstrip • Reinforced Operations Shelter • Road Improvements
~~Tern Island~~	• ~~None~~	• ~~Target Launch Pad (x m 1 x1 ft) construction area with 2 K rail~~ • ~~Telemetry/Instrumentation~~ • ~~Portion of a sea wall~~ • ~~Docking Facilities/Dredging~~
~~Johnston Atoll~~	• ~~Upgrade existing bunker~~	• ~~Target Launch Facility~~ • ~~Telemetry/Instrumentation~~ • ~~Dredging~~



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EXPLANATION

Existing Facilities/Landmarks

Boundary of PMRF

Boundary of Polihale State Park

Potential New Facility Locations

Kauai Test Facility

Contour Lines (ft)

Note: All locations are approximate.

PMRF Pacific Missile Range Facility
KTF Kauai Test Facility

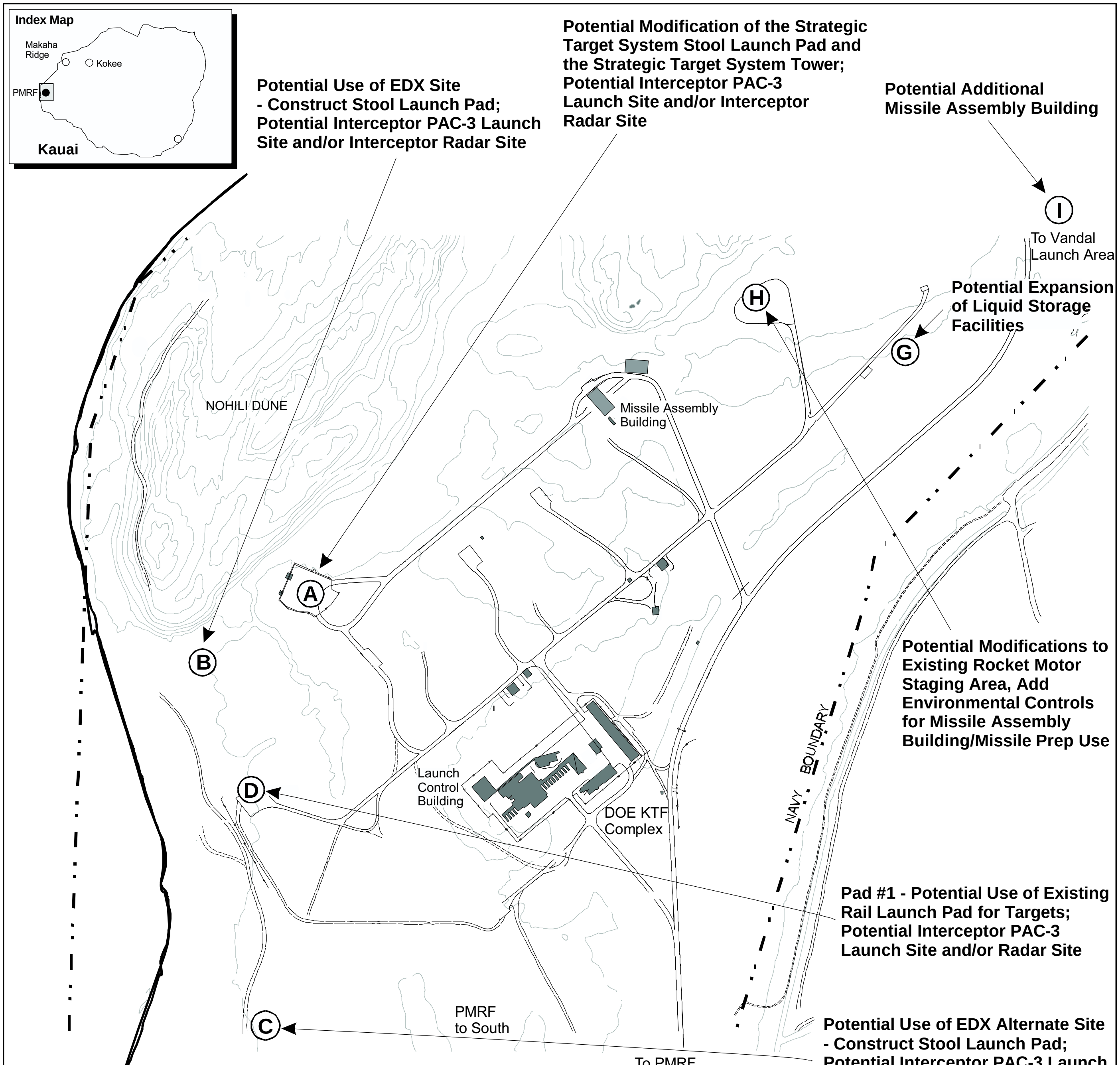
Scale
2   1, 8   Meters
2,   ,2   Feet

NORTH

Potential Sites (Revised)

PMRF/Main Base, Kauai, Hawaii

Figure 2.3.4-1



Source: Modified from Pacific Missile Range Facility, 1 , Jan.

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EXPLANATION

Existing Facilities/Landmarks

(A) Potential New Facility Locations

Contour Lines

DOE	Department of Energy
ED	Exoatmospheric Discrimination Experiment
PAC-3	PATRIOT Advanced Capability-3
PMRF	Pacific Missile Range Facility
KTF	Kauai Test Facility

Note: All locations are approximate

NORTH

Scale

1 2 Meters

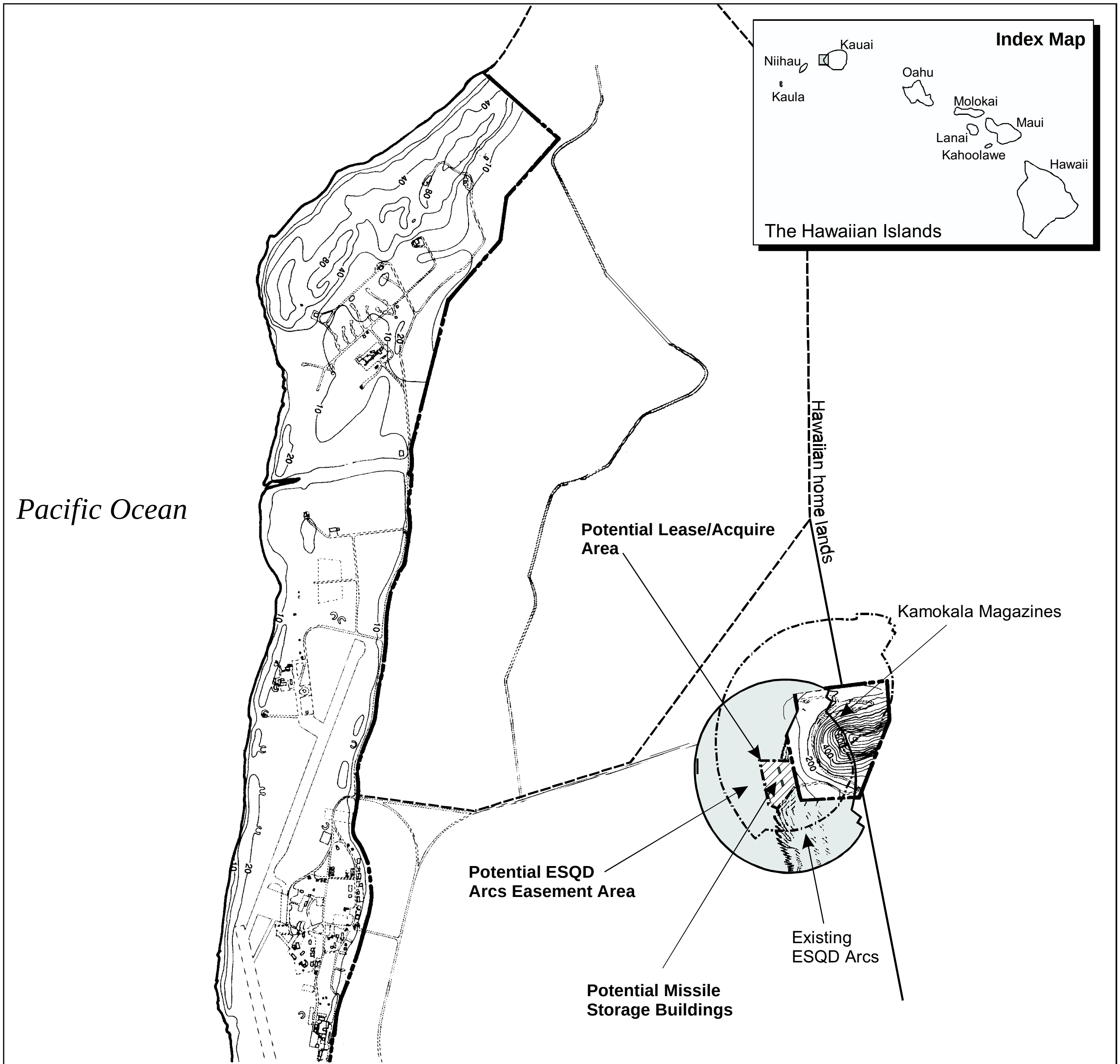
31 28 Feet

Potential Sites (Revised)

PMRF/Main Base - Kauai Test Facility, Kauai, Hawaii

Figure 2.3.4-2

paa ktf 1



Source: U.S. Department of the Navy, 1 , Oct, p.D- .

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EXPLANATION

- Pacific Missile Range Facility
- Existing Explosive Safety Quantity Distance(ESQD) Arcs
- Potential Explosive Safety Quantity Distance Arcs
- Restrictive Easement Boundary
- Potential Missile Storage Buildings
- Contour Lines (ft)
- Potential ESQD Arcs Easement Area
- Potential Lease/Acquire Area

Scale
2 88 Meters
1, 2, Feet

NORTH

Potential Missile Storage Buildings (Revised)

Kamokala Magazines,
Kauai, Hawaii

Figure 2.3.4-3

paa kamokala 1

required to have some level of secondary containment. A new missile assembly building would be constructed at Site I (figure 2.3.4-2).

The additional target launches would require two new missile storage buildings and a surrounding security fence near the Kamokala Magazines (figure 2.3.4-3) to allow for long-term storage of target booster systems. Placing the proposed missile storage buildings at this site would require an acquisition of approximately 2 ha (5 ac) of State lands, either by lease or fee purchase, and an ESQD restrictive use easement (approximately 50 ha [125 ac]).~~a leasing agreement with the State of Hawaii for use of State lands (approximately 20 ha [50 ac]) and a restrictive easement (approximately 506 ha [1,250 ac]).~~ In addition, a temporary, portable propellant fuel storage unit (Site G, see figure 2.3.4-2), with an appropriate spill containment system, would be required at KTF.

2.3.4.1.2 Launch Facilities—Interceptors

The Area TMD land-based mobile interceptor units being considered are all self-contained and would require nothing more than a cleared, level, compacted area to set up and operate. Several sites have been identified as potential locations for placement of these mobile interceptor systems, including Site A, the Strategic Target System Pad; Site B, Pad 1; Sites C and D; and Site E located south of the Nohili Ditch (figures 2.3.4-1 and 2.3.4-2).

For the Area TMD systems, the interceptor units would be located at these sites and the associated radar units located at appropriate safety standoff distances within the KTF area.

The minimum facilities required would be a hardstand area (42.1 by 20.1 m [138 by 66 ft]), preferably a gravel or coral base on relatively level ground. Typically, launchers would be sited within a 120-degree angle of the radar signal (that is, 60 degrees on each side of the boresight) and located between 130 m (427 ft) and 10 km (6.2 mi) from the radar. Several launchers may be sited within this area.

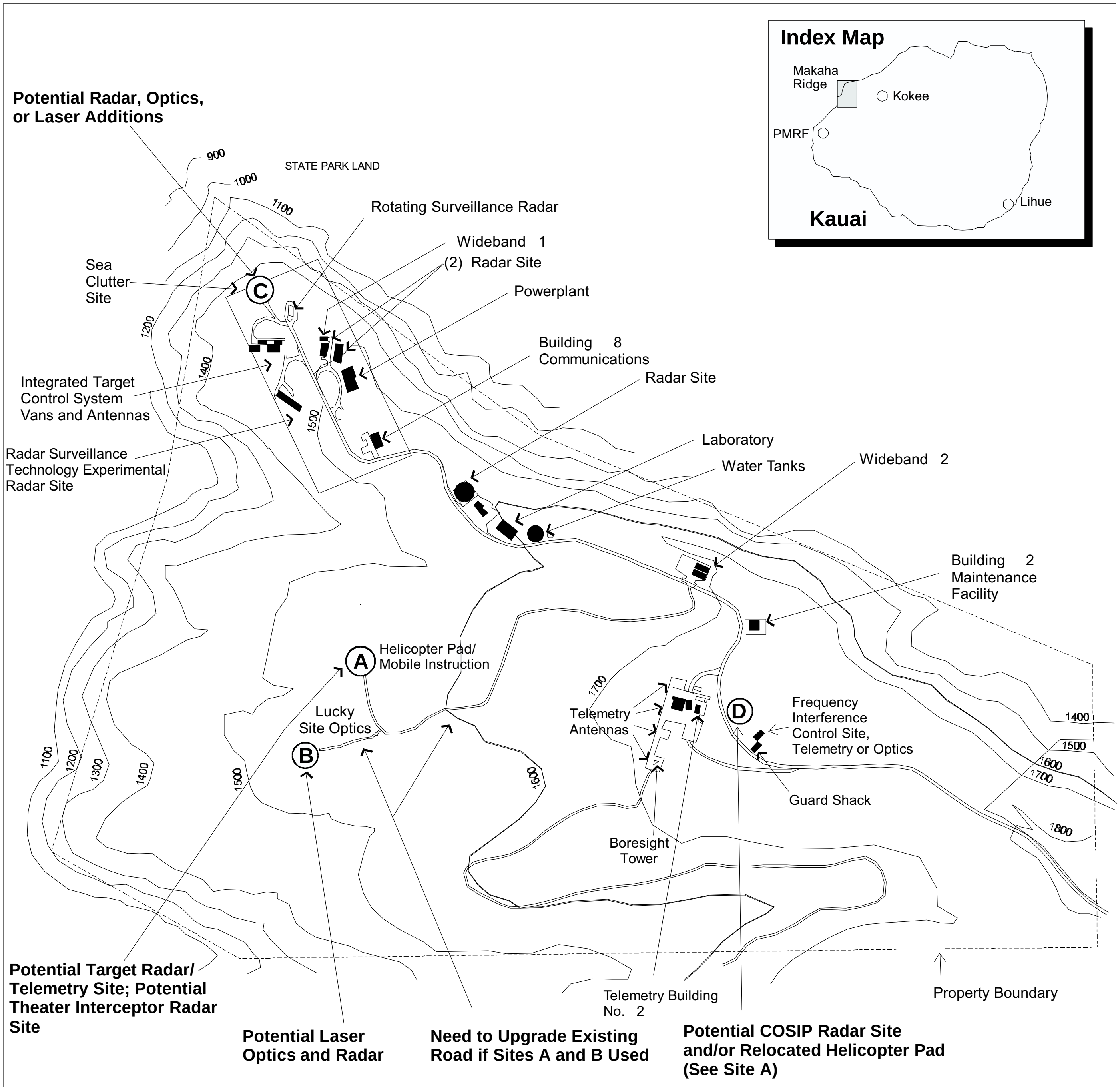
2.3.4.1.3 Instrumentation Facilities

2.3.4.1.3.1 Existing

The existing radar, telemetry, and communications facilities at PMRF/Main Base, Makaha Ridge, and Kokee identified in sections 2.2.1.5.3 and 2.2.1.5.4 would be used.

2.3.4.1.3.2 Modification, Expansion, and Replacement

The Proposed Action would require the potential refurbishment or expansion of existing laboratories or buildings (figure 2.3.4-4).



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Source: Modified from U.S. Department of the Navy, rev. 1 2, 1 Mar.

EXPLANATION

Existing Facilities/Landmarks

Ⓐ Potential New Facility Locations

Contour Lines (ft)

Note: All locations are approximate.
PMRF Pacific Missile Range Facility
COSIP Coherent Signal Processing

Scale
2 183 Meters
3 Feet

NORTH

Potential Sites

Makaha Ridge, Kauai, Hawaii

Figure 2.3.4-4

2.3.4.1.3.3 New

At Makaha Ridge, the Proposed Action would require a COSIP radar, mobile imaging radar, telemetry, optics, and command, control, and subsystems—sites A, B, C, and D. The existing helicopter pad may be relocated (figure 2.3.4-4).

At Kokee, the Proposed Action (figure 2.3.4-5) would require the addition of a MOTR, an instrumentation building, an imaging radar, telemetry receiving antennas, and towers or platforms for communications equipment. Existing instrumentation may be upgraded with improved subsystems—sites A, B, and C. These activities would involve additional uses of lands within existing leases but would not require revisions of the leases. The current lease term runs through 31 January 2030.

2.3.4.1.4 Communications, Command, and Control Facilities

2.3.4.1.4.1 Existing

The existing communications, command, and control facilities at KTF identified in section 2.2.1.5.4 would be used.

2.3.4.1.4.2 Modification, Expansion, and Replacement

Multiple target command and control, as well as range safety monitoring and FTSs, would be enhanced. Transmitters and receivers and other communications equipment would also need to be upgraded.

2.3.4.1.4.3 New

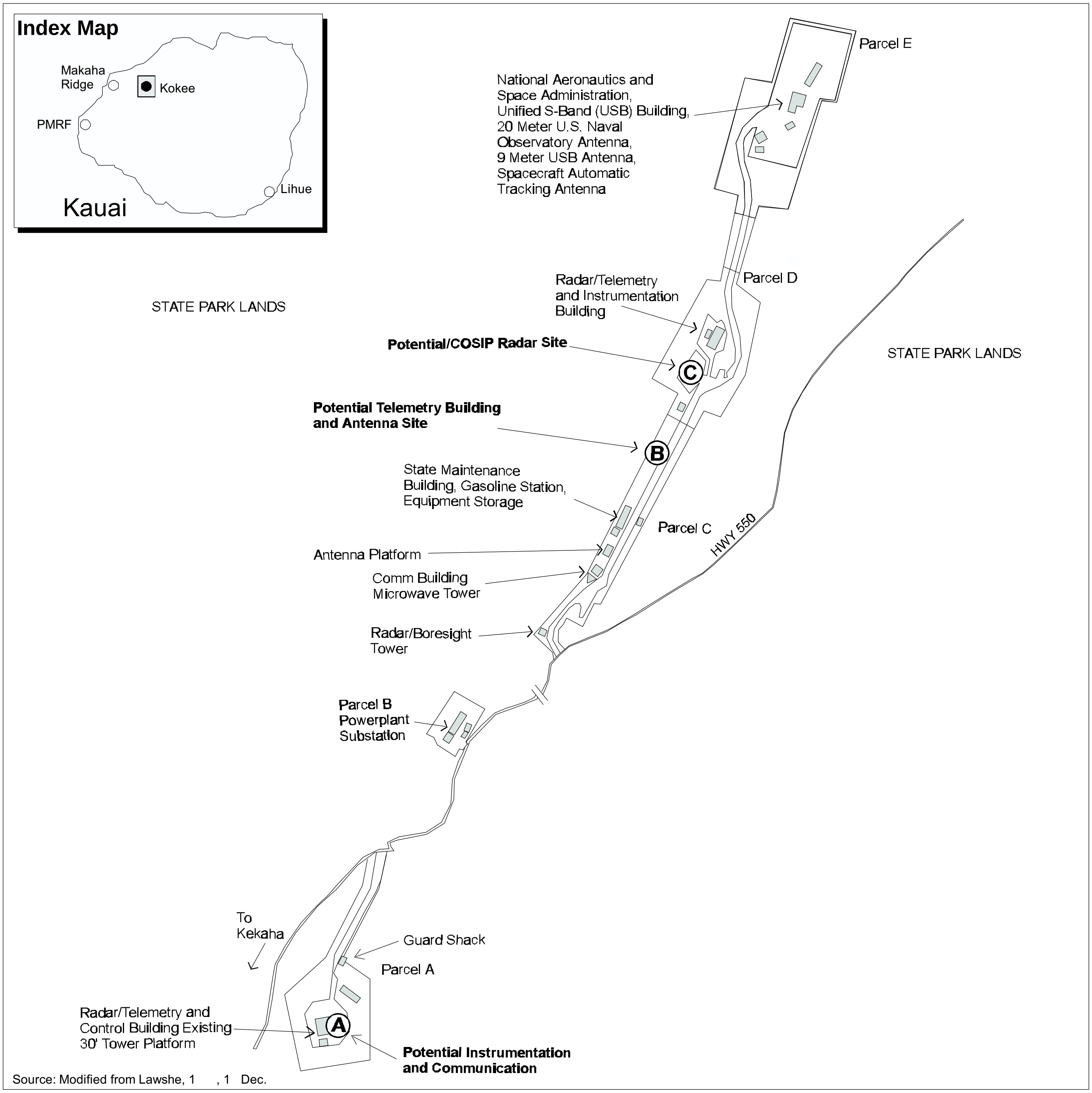
No new communications, command, and control facilities would be built at KTF under the Proposed Action.

2.3.4.1.5 Infrastructure—Facilities

Access roads to the proposed facility enhancement sites at Makaha Ridge would be upgraded (figure 2.3.4-4).

2.3.4.2 Niihau

Implementation of the Proposed Action would require the construction of new facility sites at several locations on the island. These proposed activities are identified below, with their locations shown in figure 2.3.4-6.



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EXPLANATION

Existing Facilities/Landmarks

(A) Potential New Facility Locations

Note: All locations are approximate.
PMRF Pacific Missile Range Facility
COSIP Coherent Signal Processing

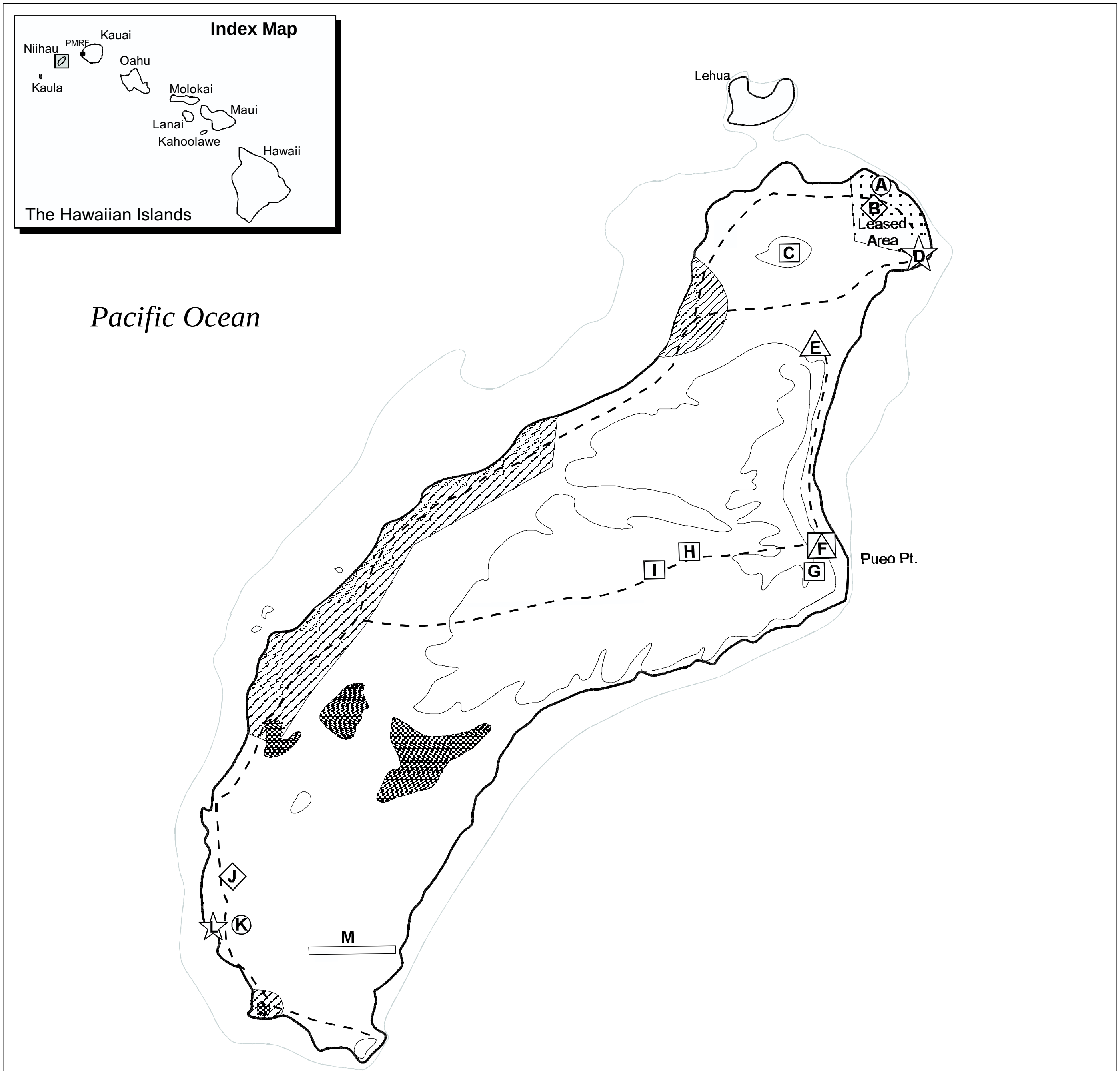
NORTH

Scale
11 22 Meters
3 2 Feet

Potential Sites

Kokee, Kauai, Hawaii

Figure 2.3.4-5



Source: Modified from Niihau, undated.

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EXPLANATION

Joint Use Approved Areas

Keep-Out one

Lakes (Playa)

Contour Lines

Dirt Roads

PMRF Pacific Missile Range Facility

NORTH

Scale

2.1 .2 Kilometers

1.3 2. Miles

Existing Logistics Landing Site

Potential New Facility Locations

Aerostat Site

Communications (Telemetry/Instrumentation) Optics Site

Launch Site

Launch Control Area

Aerostat and Communication Optics Site

Airstrip

Potential Sites (Revised)

Niihau, Hawaii

Figure 2.3.4-6

paa niihau 1

2.3.4.2.1 Launch Facilities— Targets

Two potential launch sites have been identified Site A on the northern portion of the island (figure 2.3. -) and Site K on the southern portion of the island. For each proposed site selected, an LC would be constructed, consisting of a - by -m (1 - by 1 -ft) concrete pad, a portable environmental shelter, a launch control facility, and a reinforced concrete operations shelter, at Sites B and J. Much of the missile assembly and preparation would be conducted at KTF, with only the launch operations conducted atNiihau. Because of the vegetation fire hazard during the summer months, the Navy would create and maintain fire breaks, and fire-fighting equipment would be present during launches.

2.3.4.2.2 Launch Facilities— Interceptors

The proposed target launch sites, A and K, identified above would also support interceptor launches, since interceptors require only a cleared, secured, level, compacted area to set up and operate. It is anticipated that the same reinforced concrete personnel shelter and hard stand constructed for targets would be utilized.

2.3.4.2.3 Instrumentation Facilities

Two potential telemetry and instrumentation sites E and F have been identified on the northern portion of Niihau. Each telemetry and instrumentation site would be self-contained, with power supplied by solar energy or portable generators. A tethered Aerostat system, a small unmanned airship attached to a concrete pad, would carry needed range support systems, such as data collection (telemetry) and tracking systems (infrared or optical). Five potential Aerostat sites have been proposed C, F, G, H, and I (see figure 2.3. -). A fenced, leveled, packed dirt clearing of by m (1, by 1, ft) would be required for the mooring system. A payload storage building with a concrete base would also be required.The -m (2 3-ft) long Aerostat would be attached to the ground with three tether cables and would operate at altitudes of between 3, 8 to , 2 m (1 , to 1 , ft) and require a .8-km (3-mi) radius Restricted Area from ground level to ,182 m (1 , ft), in which no aircraft would be permitted. Portable generators would provide power to the site. Use of the UAVS in con unction with Aerostat, which would receive information from the UAVS and relay the information to PMRF, is also proposed.

2.3.4.2.4 Communications, Command, and Control Facilities

Communications, command, and control facilities would be provided in the portable, protected van shelters that would be part of the launch control facilities identified above.

The tethered Aerostat system and the UAVS, which has an existing emergency landing site on Niihau, would also carry communication relays (command and control).

2.3.4.2.5 Infrastructure— Facilities

New infrastructure facilities proposed by PMRF forNiihau include a 1,82 -m (, -ft) airstrip at Site M. Improved road access, involving the grading of existing roads, would also be required between the airstrip and the proposed launch and instrumentation sites. The existing logistics landing site, Sites D and L, would be used.

2.3.4.3 Tern Island

Tern Island ~~is~~ was being ~~proposed~~ considered as a launch site for targets, and for instrumentation only, and only as a fall-back to the preferred use of aircraft and mobile sea platforms to launch target missiles. Tern Island is no longer being considered as a part of the Proposed Action.

2.3.4.3.1 Launch Facilities—Targets

2.3.4.3.1.1 Modification, Expansion, Replacement

No modification or expansion of existing facilities would be required.

2.3.4.3.1.2 New

One potential launch site is proposed, at Site A for a 9,072 kg (20,000 lb [20K]) rail launcher (figure 2.3.4-7). The launch pad, target support and preparation, and launch control facility requirements were identified in table 2.3.4-2 above. Use of the free floating MATSS is also proposed off Tern Island, located beyond the 36.6-m (20-fathom) contour. The base of the concrete or asphalt launch pad at Site A (see figure 2.3.4-8 for overall dimensions) would be constructed from crushed coral from the dredge spoil from the harbor boat channel off the southwestern end of Tern Island at Site B, and from the dredging of the mooring area on the northwestern end of the island to accommodate the 24-m (80-ft) beam of the MATSS, and its tug. Details of the construction methods and the precise site would require studies of the prevailing water currents to avoid impacts to the existing sea wall and beaches, and prior consultation with the USFWS.

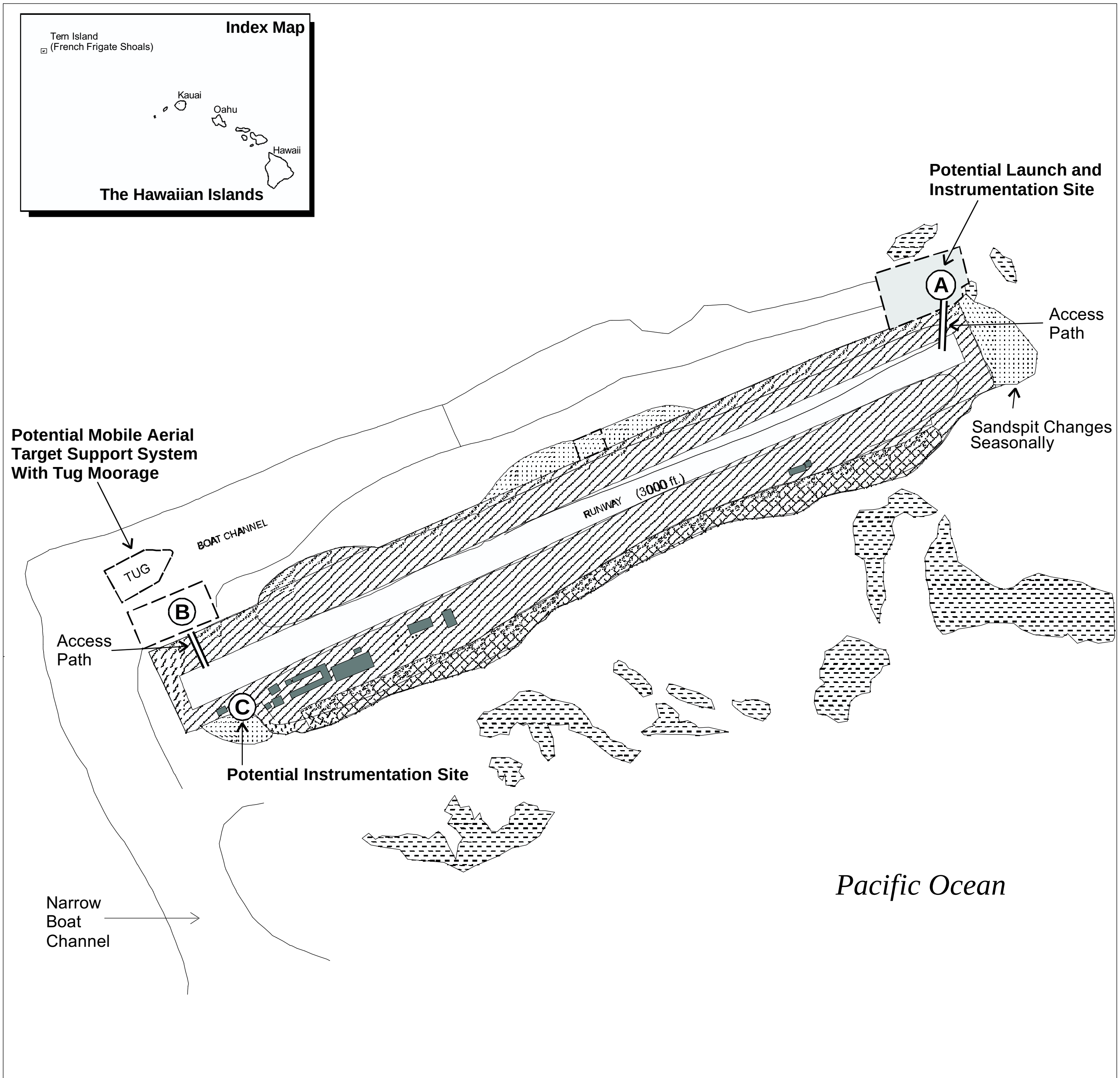
2.3.4.3.2 Instrumentation Facilities

The proposed launch site, Site A, is also a proposed instrumentation site for radar, telemetry, optics, electronic warfare, and DGPS systems. Maximum use of the existing structures, foundations, and infrastructure would be made for the instrumentation site. The preferred option would be to keep all instrumentation on the MATSS, but if necessary, the instrumentation would be located on existing foundations or structures.

Instrumentation placed on the island may include the unenclosed radar and 6-m (10-ft) parabolic telemetry dishes with 6- to 9-m (10- to 15-ft) antenna with suitcase-sized electronics packages at Site C. Other instrumentation would be aboard the MATSS. Power would be provided by the two 300-kW generators aboard the MATSS. All fuel and wastewater would be kept onboard the MATSS. Details on the placement of instrumentation would be coordinated with the USFWS, along with a decision of whether to enclose the radar and telemetry dishes. MATSS is also proposed at Tern Island for instrumentation at Site B. A buried cable would run from the launch site, Site A, down the side of the airstrip to the MATSS moored at the northwest end of Tern Island at Site B.

2.3.4.3.3 Communications, Command, and Control Facilities

The MATSS would carry all the communications, command, and control facilities.



Source: Modified from U.S. Department of the Interior, 1 8 , May, p.3.1

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EXPLANATION

Existing Facilities/Landmarks

(A) Potential New Facility Locations

Coral Reef

Bird Nesting Area

Note: All locations are approximate.

Scale

83 1 Meters

2 2 Feet

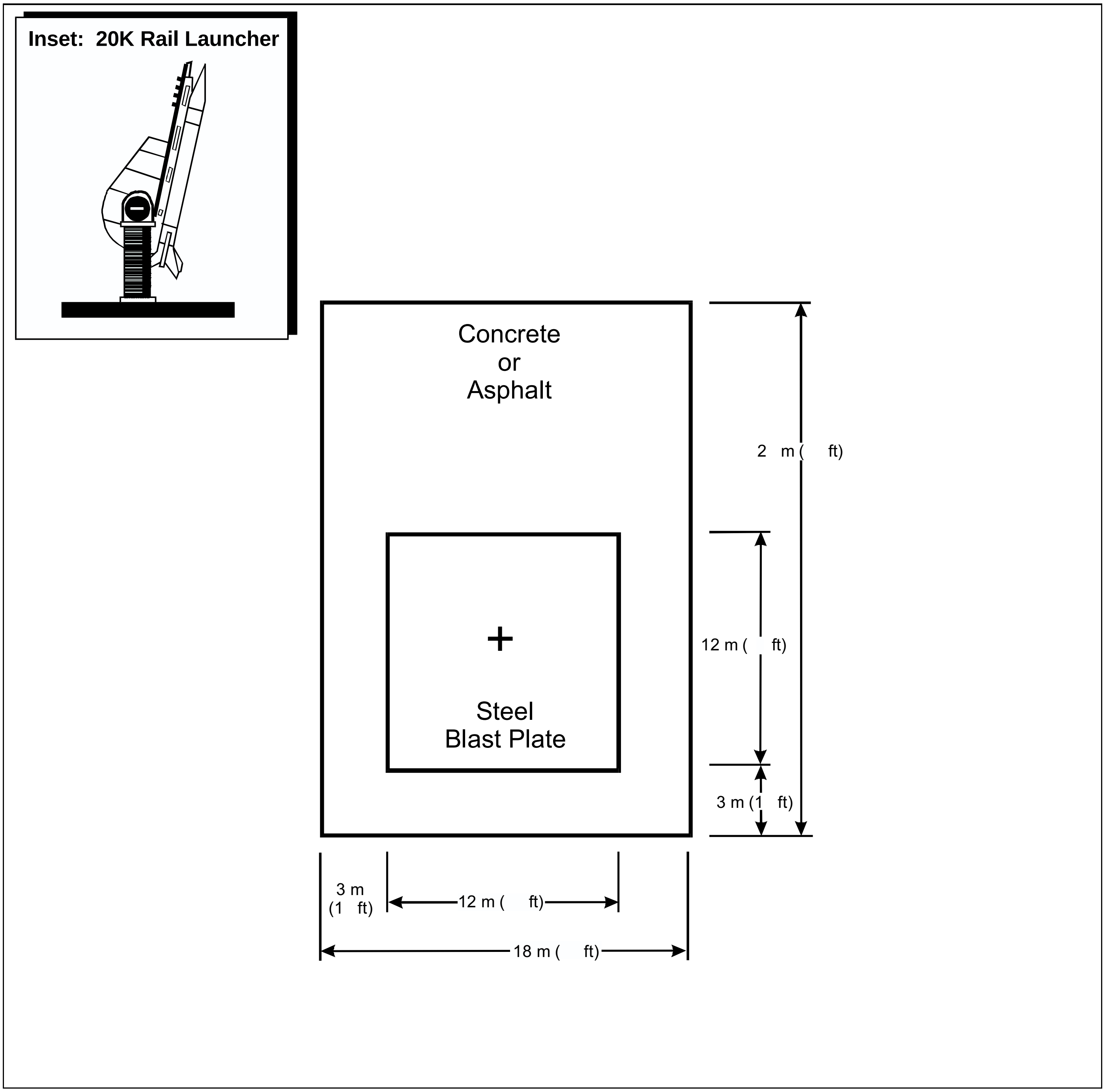
NORTH

paa tern 1

Potential Sites

Tern Island (French Frigate Shoals), Hawaii

Figure 2.3.4-7



Approximate Dimensions of Rail Launch Pad at Site A and Conceptual Diagram of the Proposed 20K Rail Launcher (Inset)

Tern Island (French Frigate Shoals), Hawaii

Figure 2.3.4-8

2.3.4.3.4 Infrastructure—Facilities

Dredging from the west end of the island to the existing channel would be required, along with the construction of docking facilities at Site B (figure 2.3.4-7) to bring supplies and equipment to the island, as well as provide a docking facility for the MATSS and its tug. Two access paths constructed from dredged coral would be built. One would connect the MATSS moorage area to the airstrip, and the other would connect the launch pad area to the airstrip.

2.3.4.4 Johnston Atoll

Johnston Atoll ~~is~~ was being ~~proposed~~ considered as a launch location for TMD targets, and instrumentation, and only as a fall-back to the preferred use of aircraft and mobile sea platforms to launch target missiles. Johnston Atoll is no longer being considered as a part of the Proposed Action.

2.3.4.4.1 Launch Facilities—Targets

2.3.4.4.1.1 New

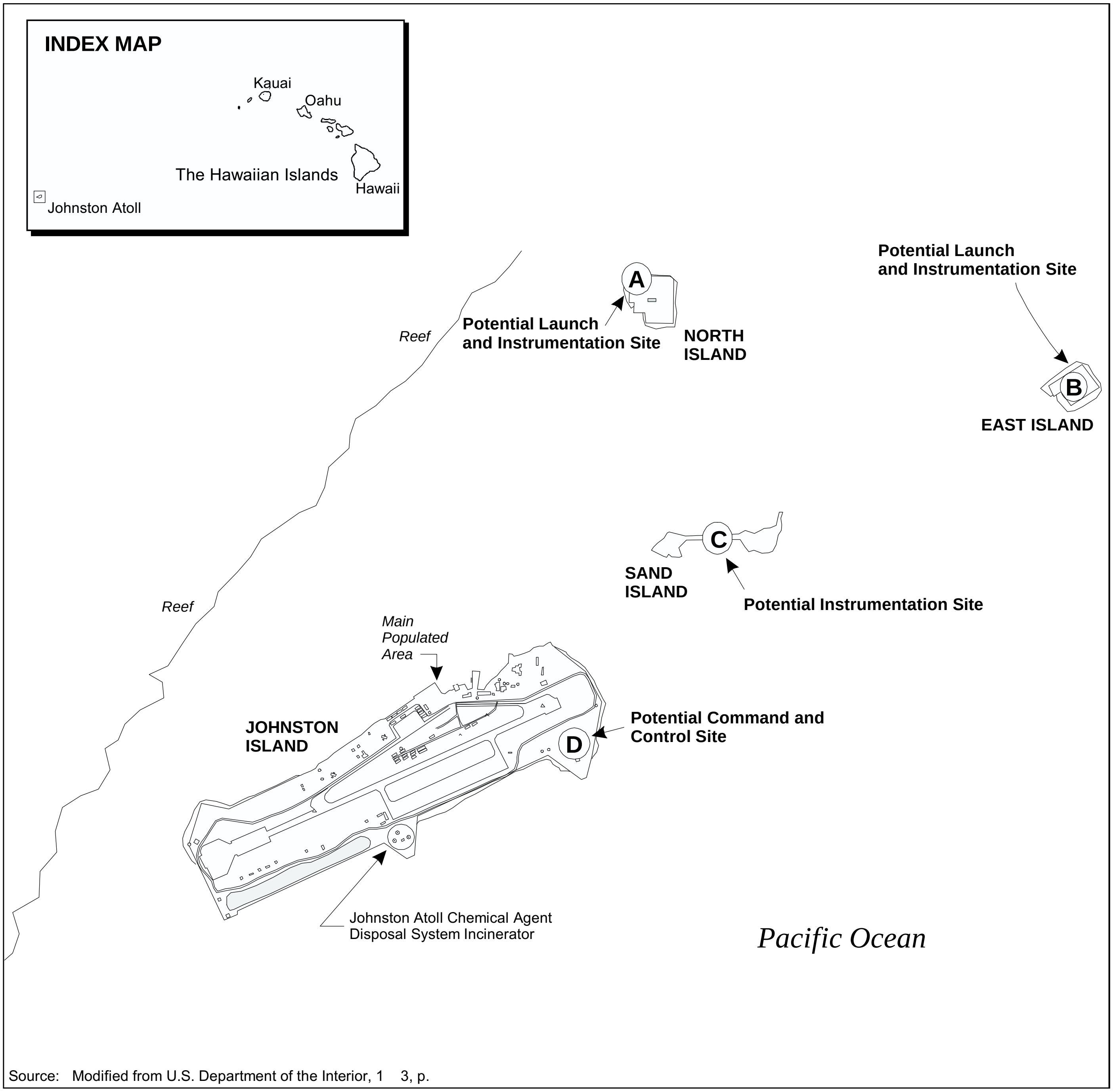
Two potential launch locations for a new 9,072-kg (20,000-lb) (20K) rail launcher, or a new vertical launch system have been identified: Site A on Akau (North) Island, and Site B on Hikima (East) Island (figure 2.3.4-9). The generic launch pad requirements, as well as the target support and preparation and launch control facility requirements, were identified in table 2.3.4-2. The dimensions of the launch pad base, either for a stool or a rail is given in figure 2.3.4-10. If Site A is selected, no dredging would be necessary. However, if Site B on Hikima (East) Island is selected, dredging of the channel to the island would be necessary. Close consultation with the USFWS would occur before implementation of the Proposed Action.

2.3.4.4.2 Instrumentation Facilities

Either of the two of the proposed launch sites is also a proposed instrumentation site, together with Site C on Sand Island, for radar, telemetry, optics, electronic warfare, and DGPS systems. The generic instrumentation facility requirements were identified in table 2.3.4-2. Maximum use of the existing structures, foundations, and infrastructure would be made for the instrumentation site. Instrumentation placed on the island may include the radar and 6-m (10-ft) parabolic telemetry dishes with 6 to 9-m (10 to 15-ft) antenna with suitcase-sized electronics packages. Other instrumentation would be aboard the MATSS. Power would be provided by the two 300-kW generators aboard the MATSS. All fuel and wastewater would be kept onboard the MATSS. Details on the placement of instrumentation would be coordinated with the USFWS.

2.3.4.4.3 Communications, Command, and Control Facilities

Either the MATSS would carry all the communications, command, and control facilities or they would be placed in portable, protected van shelters located at Site D on Johnston Island.



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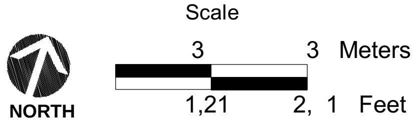
EXPLANATION

Existing Facilities/Landmarks

Ⓐ Potential New Facility Locations

Note: All locations are approximate.

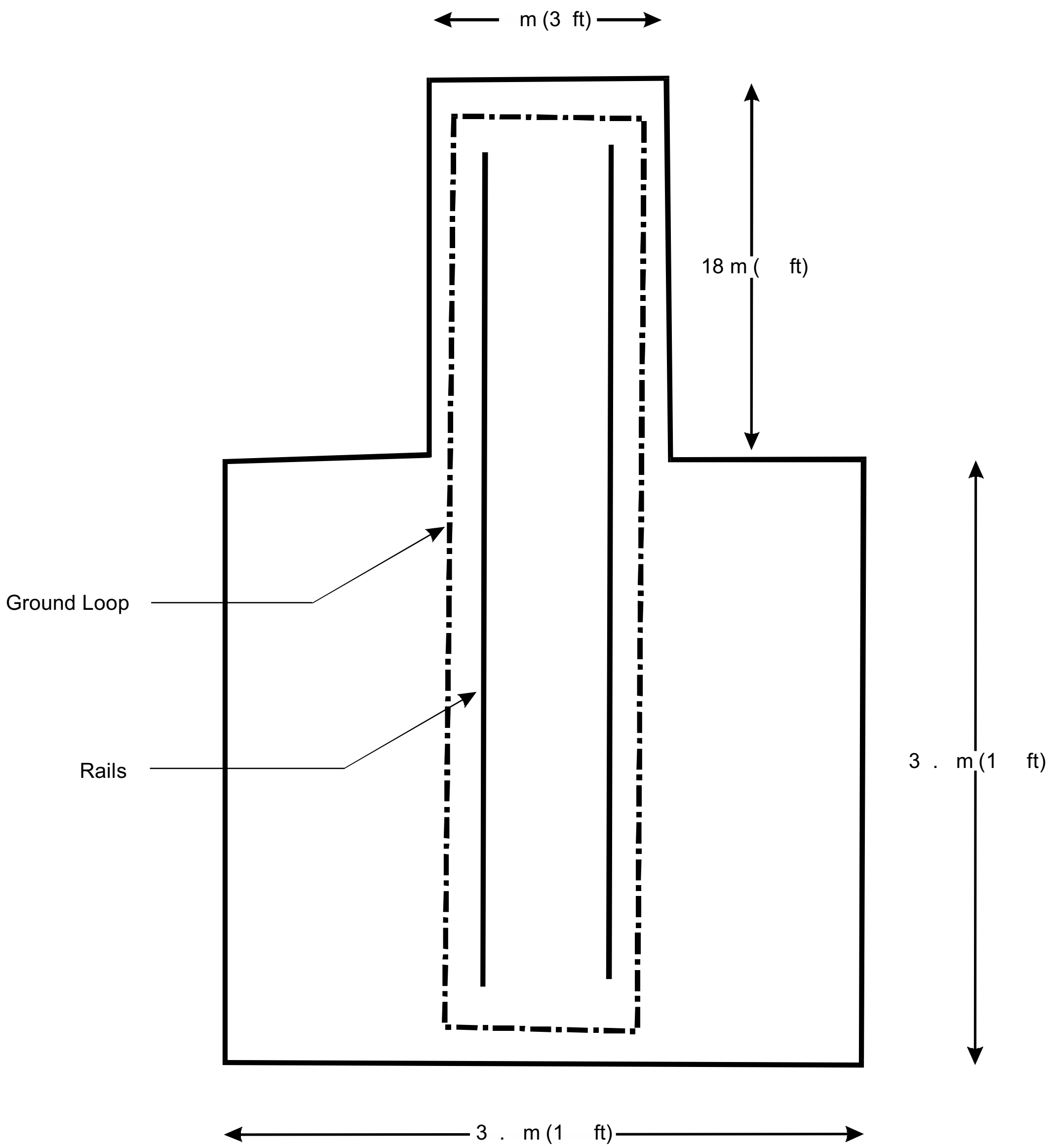
Potential Sites



Johnston Atoll

Figure 2.3.4-9

paa ohnston 1



Approximate Dimensions of Stool Launch Pad at Either Site A, North Island, or Site B, East Island, Johnston Atoll

Figure 2.3.4-10

2.3.4.4.4 Infrastructure—Facilities

Existing structures, foundations, and infrastructure would be used under the Proposed Action. Dredging from Johnston Island to the west end of Hikima (East) Island would be necessary to accommodate the 24-m (80-ft) beam (maximum width) of the MATSS. Dredge spoil would be used for the Launch Pad base if Site B is selected. If necessary, details of the precise construction methods and actual site would require studies of the prevailing water currents to avoid impacts to the existing beaches. Prior consultation with the USFWS would occur before implementation of the Proposed Action.

2.3.5 RANGE OPERATIONS AND TRAINING—PROPOSED ACTION ALTERNATIVE

2.3.5.1 Fleet Operations and Training

2.3.5.1.1 Missile Operations

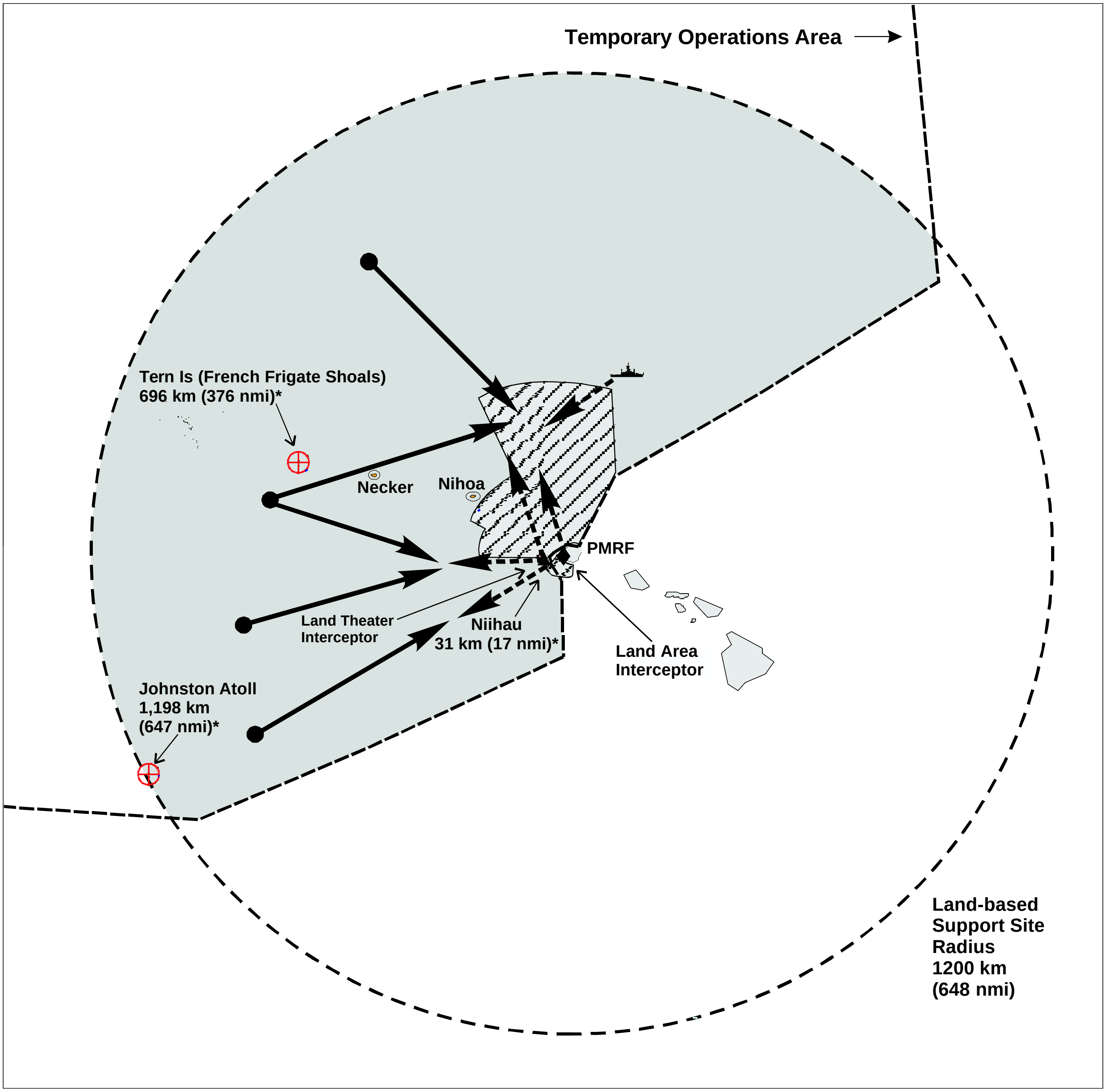
Missile operations include the initial developmental and operational testing, and subsequent fleet training as the missile systems are introduced into the fleet. Shipboard sensors and instrumentation systems would be aboard fleet assets, including an impact observation ship, a radar ship, the telemetry and FTS ship, and an assist ship that would be deployed during developmental testing and fleet training.

The weapons and target systems planned for use in the Proposed Action, as well as their propellants and exhaust components, are given in table A-15, appendix A.

2.3.5.1.1.1 Developmental and Operational Testing

The proposed defensive missiles would be flight tested from AEGIS cruisers and destroyers equipped with upgraded AEGIS combat systems that would detect and track short to medium range TBMs and engage them, destroying the TBM in flight during its descent phase. The TBMD-capable ships would accept and use cueing data from a number of sources, including ships, land-based sensors, airborne sensors, and links and broadcasts from national sensors (satellites).

Developmental and operational testing would satisfy the following: (1) the simultaneous presentation of multiple airborne targets, (TBM targets and anti-ship cruise missile targets); (2) encrypted telemetry for targets and interceptors; and (3) the presence of active and passive countermeasures. Early tests would be conducted over the open ocean to the north, northwest, and west of PMRF. Associated operations would be conducted closer to land to simulate near-shore environments. Figure 2.3.5-1 shows representative intercept scenarios for air- and sea-based targets. These would take place within the Ocean Launch Area, which could occur anywhere within the 1,200-km (648-nmi) portion of the Temporary Operations Area. ~~Figures 2.3.5-2 and 2.3.5-3 show representative intercept scenarios for land-based targets.~~ The only land-based target launch locations being considered are PMRF/Main Base (KTF) and Niihau.



EXPLANATION

- Ship Area Interceptor
- Land Theater Interceptor
- Land Area Interceptor
- Potential Land-based Sites
- Island
- Warning Area
- Ocean Launch Area
- Air Drop and/or Mobile Platform Seabased (MATSS or SLP) Target
- Target Corridor
- Interceptor Corridor

km	Kilometers
nmi	Nautical Miles
PMRF	Pacific Missile Range Facility
MATSS	Mobile Aerial Target Support System
SLP	Sea Launched Platform
*	Approximate distance to PMRF
**	Launch location anywhere within Ocean Launch Area

Scale

18 3 8 Kilometers

1 2 2 Nautical Miles

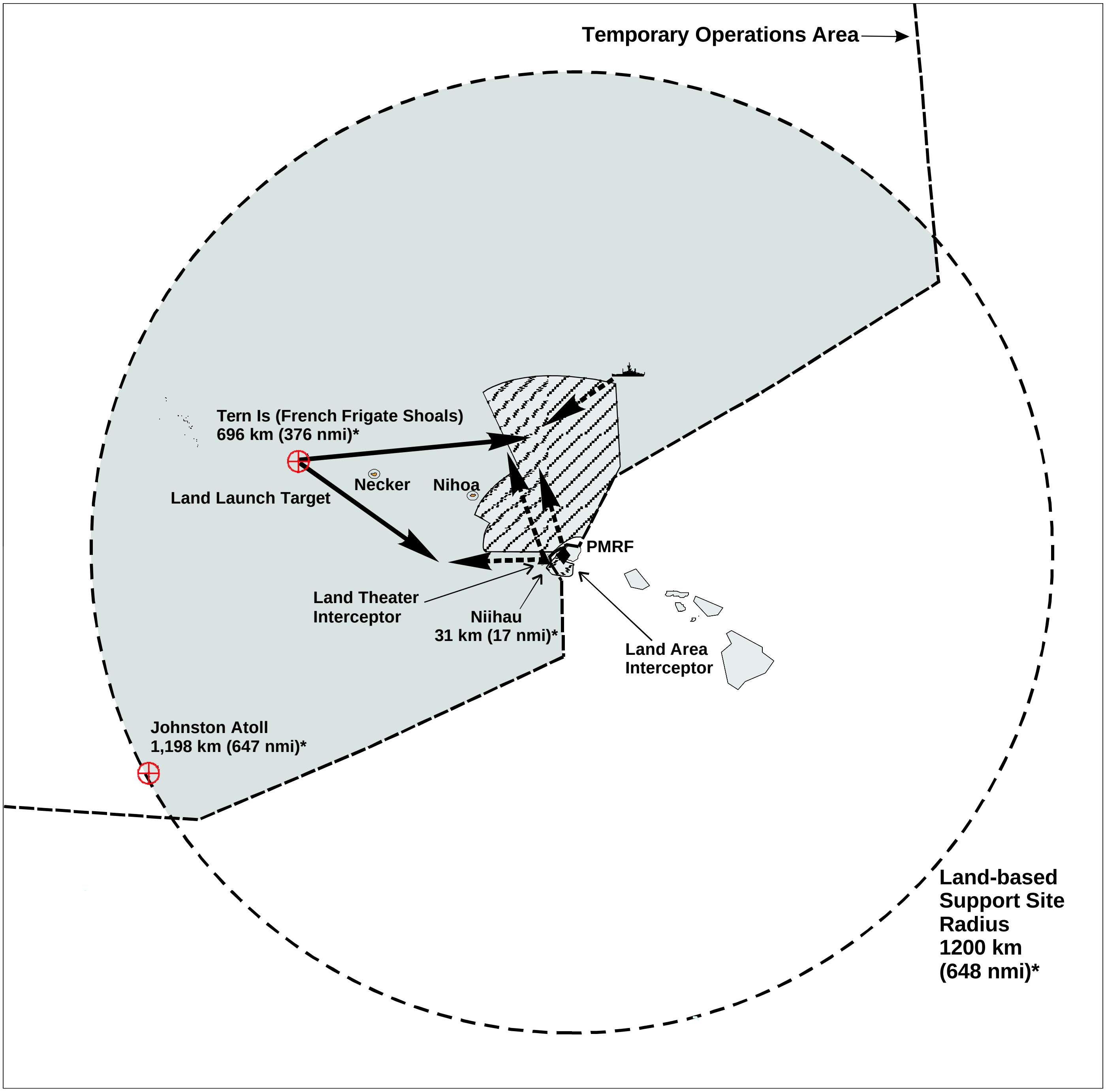
NORTH

Pacific Missile Range Facility (Niihau) - Open Ocean Conceptual Intercept Scenarios

Open Ocean

Figure 2.3.5-1

paa pmrf open 1



EXPLANATION

- Ship Area Interceptor
- Land Theater Interceptor
- Land Area Interceptor
- Potential Land-based Sites
- Island
- Warning Area
- Ocean Launch Area
- Target Corridor
- Interceptor Corridor

km Kilometers
nmi Nautical Miles
PMRF Pacific Missile Range Facility
MATSS Mobile Aerial Target Support System
* Approximate Distance to PMRF

NORTH

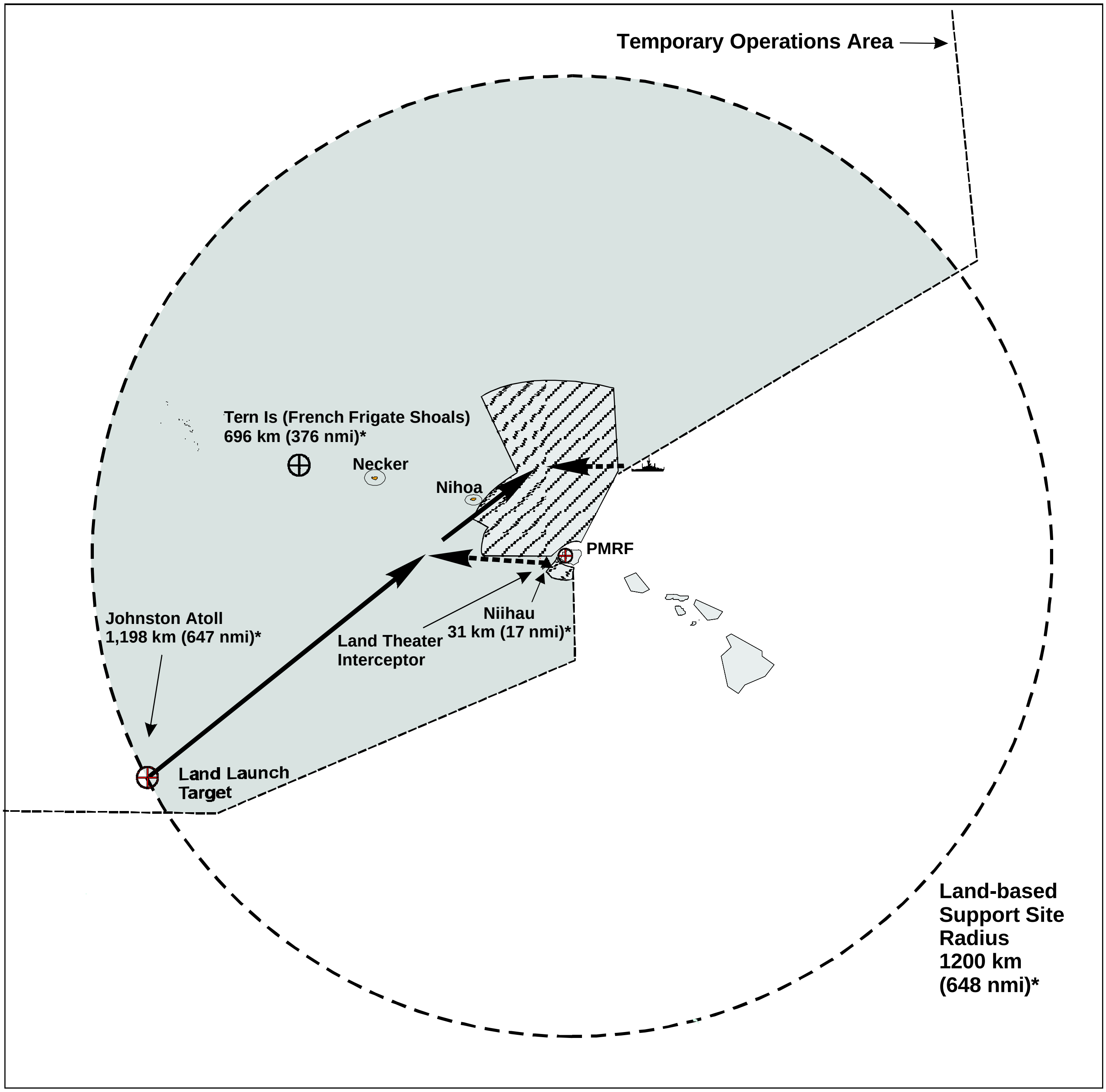
Scale
18 3 8 Kilometers
1 2 2 Nautical Miles

Pacific Missile Range Facility (Niihau) - Tern Island Conceptual Intercept Scenarios (Deleted)

Tern Island, Hawaii

Figure 2.3.5-2

paa pmrf tern 1



EXPLANATION

- Ship Area Interceptor
- Land Theater Interceptor
- Potential Land-based Sites
- Island
- Warning Area
- Ocean Launch Area
- Target Corridor
- Interceptor Corridor

km Kilometers
nmi Nautical Miles
PMRF Pacific Missile Range Facility
MATSS Mobile Aerial Target Support System

* Approximate Distance to PMRF

Scale

18 3 8 Kilometers

1 2 2 Nautical Miles

NORTH

Pacific Missile Range Facility (Niihau) - Johnston Atoll Conceptual Intercept Scenarios (Deleted)

Johnston Atoll

Figure 2.3.5-3

paa pmrf ohnston 1

Combat System Ship Qualification Trials

The Combat System Ship Qualification Trials (CSSQT) testing would be conducted after the developmental-operational testing to demonstrate the capability of the ship s force to maintain and operate the combat system, and to achieve battle group readiness by actual demonstration through operationally realistic exercises of the installed system. The CSSQT would combine production and developmental testing with the new capabilities installed in each ship, allowing AEGIS to maintain its threat preparedness. These exercises would typically last 11 weeks, of which would be at sea. A total of approximately three to four ships per year would conduct these exercises over the duration of the program.

Post Regular Overhaul Training and Testing

Post Regular Overhaul Training and Testing (PRT T) trials would be conducted to demonstrate combat readiness, to verify all systems and integration programs operate as designed, and to provide crew training to restore proficiency following the crew turnover during routine overhauls.

Both the CSSQT and PRT T testing would require the addition of two to three TBM target presentations to the existing CSSQT/PRT T scenario. A total of approximately three to six ships per year would conduct these exercises over the duration of the program.

2.3.5.1.1.2 Fleet Training

After the developmental and operational testing, TBMD defensive missiles would be introduced to the fleet. This is a long process involving CSSQT, fleet exercise training, and system upgrade testing. These fleet training activities, all of which are ongoing, are described in the following sections.

AEGIS Anti-Air Warfare (now called Area Air Defense) Fleet Training Requirements Testing

During each ship s interdeployment period (about once every 2 months), three exercises would be conducted: (1) anti-ship missile defense against a single, subsonic, sea-skimming target (2) high altitude, long-range missile firing against a single, supersonic, high altitude target and (3) a low-angle missile firing against a single, supersonic, sea-skimming target. The fleet training exercises would require the addition of one TBM target presentation to the Fleet anti-air warfare tactical training requirements. A total of three to five ships per year would conduct these fleet training exercises.

2.3.5.1.2 Electronic Warfare

Proposed electronic warfare and electronic countermeasures operations, an integral part of the missile operations identified above, would take advantage of the upgraded or new electronic warfare and electronic countermeasures systems identified in section 2.2.1. . These systems would include the capability for stand-off amming, escort amming, GPS amming, chaff, on-range and/or off-range support, multi-axis electronic countermeasures, relatively long endurance on-station requirements for the off-range intercept scenarios, and high-power amming.

2.3.5.2 Land-based Operations and Training

2.3.5.2.1 Missile Launches

Target missiles would be launched from fixed locations, including KTF~~,~~ and Niihau.~~, Tern Island, and Johnston Atoll.~~ Interceptor missiles would also be launched from fixed, land-based locations, including KTF and Niihau. All intercept debris would be contained in the hazard area within the proposed Temporary Operations Area identified earlier.

The Proposed Action would require a modification to the existing ground hazard restrictive easement granted by the State of Hawaii in 1993 to extend its expiration date to 31 December 2030. This modification would address missile launches needed for the TBMD and TMD programs which would require the use of State lands adjacent to PMRF as a ground hazard area. The total number of times per year (30) that the rights under the easement are utilized and clearance time per launch (30 minutes) would not change.

2.3.5.2.2 Electronic Warfare Operations

In addition to the electronic warfare facility and device operations identified in section 2.2.1.5.2, the Proposed Action would use the modified, upgraded, or new facilities identified in section 2.3.4.1.

2.3.5.2.3 Sensor–Instrumentation Operations

In addition to the sensor–instrumentation facilities identified in section 2.2.1.5.3, the Proposed Action would use the modified, upgraded, or new facilities identified in section 2.3.3.

2.3.5.2.4 Communications Systems

In addition to the communications facilities identified in section 2.2.1.5.4, the Proposed Action would utilize the modified, upgraded, or new facilities identified in section 2.3.3.4.

2.3.5.2.5 Land-based Training

The land-based training exercises identified and described in section 2.2.1.5.5 would continue as part of the Proposed Action. The Navy TBMD program would not entail any additional land-based training.

2.3.6 BASE OPERATIONS AND MAINTENANCE—PROPOSED ACTION ALTERNATIVE

2.3.6.1 Ordnance

Implementation of the Proposed Action would require the handling, storage, and assembly of target and defensive missiles. Existing facilities at KTF would be used with the additional requirement of two new missile storage buildings identified in section 2.3.4.1.

2.3.6.2 Range Boats

Implementation of the Proposed Action would not require additional range boats to assist in test vehicle recovery, range surveillance and clearance, and at-sea transportation. However, if selected, additional landing craft or ships would be required to ferry equipment, supplies, and personnel to Niihau, Tern and Johnston islands. Existing range boat activities described in section 2.2.2.4 would continue.

2.3.6.3 Air Operations

Implementation of the Proposed Action would require approximately 44 additional air operations per year at PMRF, conducted by cargo and other aircraft.

2.3.6.4 Diving Support

Implementation of the Proposed Action would not require additional diving support at PMRF. Existing diving support activities described in section 2.2.2.6 would continue.

2.3.6.5 Visual Imaging

Implementation of the Proposed Action would require additional mobile electro-optical equipment support at PMRF.

2.3.6.6 Meteorology and Oceanography

Implementation of the Proposed Action would require additional meteorology and oceanography support at PMRF, including 40 additional meteorological balloon launches per year.

2.3.6.7 Other Support Services

Implementation of the Proposed Action would require an approximately 5 to 10 percent increase in other support services at PMRF.

2.3.6.8 Construction

Implementation of the Proposed Action would not require any additional construction, other than that addressed in section 2.3.4, at PMRF.

2.3.6.9 Ongoing Maintenance and Operations

As described under the No-action Alternative, base operations consist of the ongoing operation, maintenance, and upgrade of PMRF's facilities, including tenant facilities, family housing, guest quarters, utilities, transportation (air, ground, and marine), as well as hazardous materials and hazardous waste management. Under the Proposed Action, these activities would continue at the same level as described under the No-action Alternative, except at an increased rate for those resource areas described below.

2.3.6.9.1 Utilities

The Proposed Action activities at PMRF would require an additional 15,142 L (4,000 gal) of potable water per day; would generate an additional 6,965 L (1,840 gal) of wastewater per day; would generate ~~62,992~~ 56 metric tons ~~kg~~ (62 tons) of solid waste per year; and would require 894 additional kilowatt hours of electricity per day. Electrical use at Makaha Ridge is expected to increase by 100 percent over baseline conditions and 25 percent at Kokee. Other utilities (such as water, wastewater, and solid waste) would not increase at these sites or at Port Allen. Utilities on Niihau, Tern Island, and Johnston Atoll would make use of portable generators, bottled water, and portable wastewater facilities.

2.3.6.9.2 Transportation

Under the Proposed Action, there would be an increase in the level of air, ground, and marine transportation at PMRF.

2.3.6.9.2.1 Air

Under the Proposed Action, there would be approximately 44 additional aircraft operations at PMRF per year. This activity would not require additional airstrip, hangar, or aviation services. These operations would include cargo and fighter aircraft operations.

2.3.6.9.2.2 Ground

Under the Proposed Action, there would be 40 additional average daily trips at PMRF. The ground transportation system and maintenance activities would be the same as described for the No-action Alternative. There would be no additional traffic generated at the PMRF support sites on Kauai except during construction activities.

2.3.6.9.2.3 Marine

Under the Proposed Action, there would be no significant increase in marine operations at Port Allen. This activity would require no additional marine transportation infrastructure at Port Allen.

2.3.6.9.3 Hazardous Materials and Hazardous Waste Management

Under the Proposed Action, the general procedures in place for the management of hazardous materials and hazardous waste would continue. However, the amounts of hazardous materials used and hazardous waste generated would marginally increase. It is expected that the amounts of hazardous materials used and waste generated at PMRF would increase by 10 percent over baseline conditions as described in section 3.1.1.6. The only new type of hazardous material used would be associated with some liquid propellants.

2.3.7 EMPLOYMENT AND POPULATION-PROPOSED ACTION ALTERNATIVE

Proposed Action activities at PMRF are supported by civilian and military personnel. Under the Proposed Action, civilian positions would stabilize and may increase marginally, but no new military positions would be anticipated. It is expected that the Proposed Action would generate 3 additional visitors a day to the base who would use local hotel services. Employment at other PMRF support sites would not change.

2.4 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

The initial list of candidate locations within the 1,2 -km (8-nmi) area limit was based on a readily available database of airfields capable of accommodating at least a C-13 aircraft. The database is maintained by the Air Force Air Mobility Command and is comprehensive for the Pacific Ocean and Alaska. In addition to C-13 aircraft, the database identifies military and civilian airfields suitable for the types of aircraft needed to meet PMRF program requirements, such as C-1 1 and C- aircraft. The database was supplemented by airfields listed in the *DOD Flight Information Publication (Enroute) Supplement Pacific, Australia and Antarctica*, and *DOD Flight Information Publication (Terminal) High and Low Altitude Pacific, Australia and Antarctica, Volume 1* (U.S. Department of Commerce and U.S. Department of Defense, 1 3, Jan). 1

Although Tern Island and Johnston Atollmet the original siting criteria in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island and Johnston Atoll are no longer reasonable alternatives takes precedence over these other discussions concerning Tern Island and Johnston Atoll in this EIS.

2.4.1 APPLICATION OF EXCLUSIONARY CRITERIA

Exclusionary criteria identified below were applied to theinitial list of candidate locations to eliminate locations that did not meet program requirements. These are discussed individually below.

2.4.1.1 Transport Capability

Locations within the 1,2 -km (8-nmi) area limit can be reached by air or marine transport. ~~Table~~ The transport capability column of table 2. -1 indicates the locations remaining after the application of this criterion.

2.4.1.2 Accessibility

The criterion for accessibility excludes locations that do not have reasonable proximity to the main supporting airfield or docking facility. Easy access to target support and maintenance personnel is required year-round. This criterion excludes isolated locations that are greater than 1 km (nmi) from the supporting airfield or docking facilities. This criterion eliminates Necker and Nihoa islands in the Northwestern Hawaiian Islands, as well as smaller islands such as Kaula and Lehua Island off Niihau (see the accessibility column of table 2. -1).

2.4.1.3 Safety

The criterion for health and safety excludes commercial airfields with personnel onsite and nearby population centers, as well as locations where the target or interceptor flight corridor would pass over populated areas where people live or frequent on a routine basis Use of such locations could raise health and safety concerns as well as socioeconomic and noise issues. In addition to regular commercial airfields, other Hawaiian military airfields southeast of PMRF have been eliminated from further consideration (see the health and safety column of table 2. -1) due to conflicts with commercial aircraft flight corridors over the islands.

2.4.1.4 Area Narrowing Results

Table 2. -1 lists the locations initially considered and shows viable candidates that remained after application of the exclusionary criteria.

2.5 COMPARISON OF ALTERNATIVES

A comparison of the environmental impacts of the No-action Alternative and the Proposed Action, along with potential mitigation measures for each resource at each location, is presented in tables 2. -1 through 2. - . Environmental impacts are described briefly in the Executive Summary and are discussed in detail in section .

2.6 OTHER CONCURRENT PROGRAMS TO BE EVALUATED FOR CUMULATIVE IMPACTS

In addition to the Navy Area TBMD missile launches, two other non-TMD launch programs at KTF are reasonably foreseeable. The Minimum Cost Design Upper Stage (MCD-US) program would be a oint BMDO/Air Force program that would modify the Strategic Target System vehicle.

The Hypersonic Lifting Body (HLB) program would be a National Aeronautics and Space Administration (NASA) program designed to simulate the -33 performance in the upper atmosphere. The Strategic Target System missile would contain the HLB payload. Existing facilities at KTF would be used for both programs.

Table 2.4-1: Initially Considered Locations*

Operation Scenario	Initial Candidate Locations	Exclusionary Criteria Application: Transport Capability	Exclusionary Criteria Application: Accessibility	Exclusionary Criteria Application: Health and Safety	Candidate Locations for Evaluation
Area	PMRF, Hawaii	•	•	•	PMRF, Hawaii
	Wheeler Army Air Field, Hawaii	•	•		
	Hickam Air Force Base, Hawaii	•	•		
	Keahole-Kona, Hawaii	•	•		
	Lihue, Hawaii	•	•		
	Molokai, Hawaii	•	•		
	Waimea-Kohala, Hawaii	•	•		
	Naval Air Station Barbers Point, Hawaii	•	•		
	Marine Corps Base Hawaii Kaneohe Bay, Hawaii	•	•		
	Kahului, Hawaii	•	•		
	Bradshaw Army Air Field, Hawaii	•	•		
	Hilo International, Hawaii	•	•		
	Upolu, Hawaii	•	•		
	Niihau, Hawaii	•	•	•	Niihau, Hawaii
	Kaula, Hawaii	•			
	Lehua, Hawaii	•			
	Nihoa, Hawaii	•			
	Necker, Hawaii	•			
	Tern Island, French Frigate Shoals	•	•	•	Tern Island, French Frigate Shoals
	Johnston Atoll	•	•	•	Johnston Atoll

• = Meets exclusionary criterion. If a location does not meet an exclusionary criterion, it is no longer considered under other criteria.

* = Lanai was contacted and declined to be considered as a candidate location.

Table 2.5-1. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Pacific Missile Range Facility (Page 1 of 7)

Resource Category	PMRF/Main Base	Restrictive Easement	Makaha Ridge	Kokee	Kamokala Magazines	Port Allen
Air Quality	**No-action:** No adverse impacts. Emissions generated by base activities do not affect the regional attainment status; missile launch emissions are below health base standards beyond the ground hazard area boundary	**No-action:** No adverse impacts per the Restrictive Easement EIS. Vehicles and helicopters would emit minimal amounts of emissions. Launch emissions do not exceed health based standards	**No-action:** No adverse impacts. Infrequent emissions associated with diesel generators; no change in regional air quality	**No-action:** No adverse impacts. Infrequent emissions associated with diesel generators; no change in regional air quality	**No-action:** No impacts. Nothing present to affect air quality	**No-action:** No adverse impacts. Emissions associated with vessel use; no change in regional air quality
	Proposed Action: No adverse impacts. Increase in air emissions; no change to regional attainment status; proposed missile launch emissions are below health base standards, but cumulative particulate levels could exceed the NAAQS	**Proposed Action:** No adverse impacts. Vehicles and helicopters would emit minimal amounts of emissions. Launch emissions would not exceed health based standards	**Proposed Action:** No adverse impacts. Increased use of diesel generators; construction would create dust and VOCs; no change in regional air quality	**Proposed Action:** No adverse impacts. Increased use of diesel generators; construction would create dust and VOCs; no change in regional air quality	**Proposed Action:** No adverse impacts. Temporary emissions associated with construction; no change in regional air quality	**Proposed Action:** No adverse impacts. Increase in vessel emissions; no change in regional air quality
Airspace	**No-action:** No adverse impacts to en route airways and jet routes	**No-action:** Not analyzed; see appendix D	**No-action:** No impacts. Electromagnetic radiation exclusion zones would not affect local air traffic	**No-action:** No impacts. Electromagnetic radiation exclusion zones would not affect local air traffic	**No-action:** Not analyzed; see appendix D	**No-action:** Not analyzed; see appendix D
	Proposed Action: No adverse impacts to en route airways and jet routes	**Proposed Action:** Not analyzed; see appendix D	**Proposed Action:** No impacts. New electromagnetic radiation exclusion zones would not affect local air traffic	**Proposed Action:** No impacts. New electromagnetic radiation exclusion zones would not affect local air traffic	**Proposed Action:** Not analyzed; see appendix D	**Proposed Action:** Not analyzed; see appendix D

Table 2.5-1. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Pacific Missile Range Facility (Page 2 of 7)

Resource Category	PMRF/Main Base	Restrictive Easement	Makaha Ridge	Kokee	Kamokala Magazines	Port Allen
Biological Resources	**No-action:** No adverse impacts. Minimal effects to intertidal zone habitat vegetation, wildlife, and threatened and endangered species with implementation of mitigation measures; impacts on the threatened Newell's shearwater can be minimized by following mitigation measures outlined in earlier PMRF documentation **Proposed Action:** No adverse Impact. Same as No-action Alternative	**No-action:** No adverse impacts per the Restrictive Easement EIS. Minimal effects to vegetation, wildlife, and wetlands **Proposed Action:** No adverse impacts. Minimal effects to vegetation, wildlife, and wetlands	**No-action:** No adverse impacts. Minimal impacts to vegetation; no impacts from electromagnetic radiation generation to wildlife **Proposed Action:** No adverse impacts. Minimal impacts to biological resources from construction; new electromagnetic radiation sources would not affect wildlife	**No-action:** No adverse impacts. No impacts from electromagnetic radiation generation to wildlife **Proposed Action:** No adverse impacts. New electromagnetic radiation sources would not affect wildlife; construction would affect horticultural vegetation only	**No-action:** No impacts. No impacts are expected **Proposed Action:** No adverse impacts. Minimal impacts to vegetation or threatened or endangered species from construction	**No-action:** Not analyzed; see appendix D **Proposed Action:** Not analyzed; see appendix D
Cultural Resources	**No-action:** No adverse impacts. Potential cumulative impacts to cultural resources minimized through implementation of mitigation measures **Proposed Action:** Same as No-action Alternative	**No-action:** No impacts per the Restrictive Easement EIS. No ground-disturbing activities occur **Proposed Action:** No impacts. No ground-disturbing activities would take place	**No-action:** No adverse impacts. Cumulative effects from gradual modifications could impact Cold War assets **Proposed Action:** No adverse impacts. Alterations or modifications of existing buildings could alter Cold War assets	**No-action:** No adverse impacts. Cumulative effects from gradual modifications could impact Cold War assets **Proposed Action:** No adverse impacts. A horizontal or modifications could alter Cold War assets	**No-action:** No adverse impacts **Proposed Action:** No adverse impacts. Cumulative impacts from modification or alteration of the existing magazines	**No-action:** Not analyzed; see appendix D **Proposed Action:** Not analyzed; see appendix D

Table 2.5-1. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Pacific Missile Range Facility (Page 3 of 7)

Resource Category	PMRF/Main Base	Restrictive Easement	Makaha Ridge	Kokee	Kamokala Magazines	Port Allen
Geology and Soils	**No-action:** No adverse impacts. Continuation of missile launches would result in minimal change to soil chemistry; continuation of base operations would cause minor erosion **Proposed Action:** No adverse impacts. Increased launch activity would have minimal impacts to local soil chemistry with implementation of mitigation measures	**No-action:** No impacts per the Restrictive Easement EIS. No ground breaking activities occur **Proposed Action:** No impacts. No ground breaking activities are planned	**No-action:** No adverse impacts. Base maintenance operations could disturb the ground and cause erosion **Proposed Action:** No adverse impacts. New construction disturbs the ground and causes erosion	**No-action:** No adverse impacts. Minor base improvements could cause minimal erosion **Proposed Action:** No adverse impacts. Areas have been previously disturbed	**No-action:** No adverse impacts. Minor base maintenance activities could disturb soil **Proposed Action:** No adverse impacts. Construction could lead to erosion	**No-action:** Not analyzed; see appendix D **Proposed Action:** Not analyzed; see appendix D
Hazardous Materials and Hazardous Waste	**No-action:** No adverse impacts. PMRF has appropriate plans in place to manage hazardous materials used and generated **Proposed Action:** No adverse impacts. The 10% increase in hazardous materials and hazardous wastes can be handled and stored using existing PMRF procedures; liquid fuel training would be performed to minimize any safety impacts	**No-action:** No impacts per the Restrictive Easement EIS. The hazardous wastes from early flight termination are cleared from the Restrictive Easement **Proposed Action:** No impacts. The hazardous wastes from early flight termination would be cleared from the Restrictive Easement	**No-action:** No adverse impacts. PMRF has procedures in place to handle hazardous materials and waste **Proposed Action:** No adverse impacts. Minor increases in hazardous materials and hazardous wastes can be handled by PMRF procedures	**No-action:** No adverse impacts. Same as Makaha Ridge **Proposed Action:** No adverse impacts. Same as Makaha Ridge	**No-action:** No impacts. No hazardous materials or hazardous wastes are used at the site **Proposed Action:** No impacts. Materials and wastes from construction will be appropriately handled and disposed	**No-action:** No adverse impacts. All materials and wastes are handled according to appropriate procedures **Proposed Action:** No adverse impacts. Same as No-action alternative

Table 2.5-1. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Pacific Missile Range Facility (Page 4 of 7)

Resource Category	PMRF/Main Base	Restrictive Easement	Makaha Ridge	Kokee	Kamokala Magazines	Port Allen
Health and Safety	**No-action:** No adverse impacts. Minimal public health and safety risk to public and workers from PMRF activities **Proposed Action:** No adverse impacts. Increase in health and safety risk to public and workers with additional activities and use of liquid fuels; health and safety risks minimized through implementation of safety measures	**No-action:** No impacts per the Restrictive Easement EIS. Precautions and safety procedures have been established **Proposed Action:** No impacts. Precautions and safety procedures will be established	**No-action:** No adverse impacts. Minimal health and safety risk from generation of electromagnetic radiation to workers; no risk to public **Proposed Action:** No adverse impacts. Same as No-action Alternative	**No-action:** No adverse impacts. Minimal health and safety risk from generation of electromagnetic radiation to workers; no risk to public **Proposed Action:** No adverse impacts. Same as No-action Alternative	**No-action:** No adverse impacts. Minimal public health and safety risk from storage of ordnance **Proposed Action:** No adverse impacts. Construction of new storage magazines would be in accordance with DOD safety regulations. Minimal increase in public health and safety risk	**No-action:** No adverse impacts. Minimal public health and safety risk from current operations **Proposed Action:** No adverse impacts. Same as No-action Alternative
Land Use	**No-action:** No adverse impacts. Land uses compatible with PMRF operations; closure of public recreational areas during hazardous operations **Proposed Action:** No adverse impacts. Land uses compatible with proposed operations; additional closure of public recreation areas	**No-action:** No adverse impact per the Restrictive Easement EIS. Land use compatible with easement; closure of Polihale State Park for up to 15 hours per year until 31 December 2030 **Proposed Action:** No adverse impacts. Land use compatible with easement; closure of Polihale State Park for up to 15 hours per year until 31 December 2030	**No-action:** No impacts. Activities are consistent with the Hawaii Coastal Zone Management Program **Proposed Action:** No impacts. Same as the No-action alternative	**No-action:** No adverse impacts. Compatible with existing land use guidelines **Proposed Action:** No adverse impacts. Compatible with surrounding land use and zoning	**No-action:** No adverse impacts. Current use does not conflict with land use policies for the area **Proposed Action:** No adverse impacts. Proposed construction agrees with current land use policies for the area	**No-action:** No impacts. Existing land use is compatible with the industrial nature of the site **Proposed Action:** No impacts. No changes to land use would occur

Table 2.5-1. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Pacific Missile Range Facility (Page 5 of 7)

Resource Category	PMRF/Main Base	Restrictive Easement	Makaha Ridge	Kokee	Kamokala Magazines	Port Allen
Noise	**No-action:** No adverse impacts. Infrequent noise associated with missile launches; noise levels below safety standards; residents in Kekaha may be annoyed from southern launches; aircraft noise levels of 65 dBA and lower over sugar cane fields	**No-action:** No adverse impacts per the Restrictive Easement EIS. Infrequent noise from helicopters and rocket launches	**No-action:** No adverse impacts. Short term noise from generators	**No-action:** No adverse impacts. Intermittent use of generators	**No-action:** Not analyzed; see appendix D	**No-action:** No adverse impacts. Noise levels consistent with typical port operations
	Proposed Action: No adverse impacts. Increased frequency of missile launches; impacts similar to No-action Alternative	**Proposed Action:** No adverse impacts. Continued infrequent noise from helicopters and rocket launches until 31 December 2030; noise levels no louder than 90 dBA per event	**Proposed Action:** No adverse impacts. Construction may cause a temporary noise level increase	**Proposed Action:** No adverse impacts. Public in Kokee State Park may be exposed to temporary construction noise	**Proposed Action:** Not analyzed; see appendix D	**Proposed Action:** No adverse impacts Same as No-action Alternative
Socioeconomics	**No-action:** Beneficial impacts. Beneficial impacts to economy on Kauai	**No-action:** No adverse impacts per the Restrictive Easement EIS. Restricted use of ground hazard area temporarily delays nearby agricultural practices	**No-action:** Not analyzed; see appendix D	**No-action:** Not analyzed; see appendix D	**No-action:** Not analyzed; see appendix D	**No-action:** Not analyzed; see appendix D
	Proposed Action: Beneficial impacts. Minimal increase in beneficial impacts to economy on Kauai	**Proposed Action:** No adverse impacts. Restricted use of ground hazard area could temporarily delay nearby agricultural practices	**Proposed Action:** Not analyzed; see appendix D	**Proposed Action:** Not analyzed; see appendix D	**Proposed Action:** Not analyzed; see appendix D	**Proposed Action:** Not analyzed; see appendix D

Table 2.5-1. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Pacific Missile Range Facility (Page 6 of 7)

Resource Category	PMRF/Main Base	Restrictive Easement	Makaha Ridge	Kokee	Kamokala Magazines	Port Allen
Transportation	**No-action:** No impacts. PMRF events are discrete and intermittent	**No-action:** No adverse impacts per the Restrictive Easement EIS. Closure of road to Polihale State Park for up to 15 hours per year	**No-action:** No impacts. Current personnel provide minimal effects to the transportation system	**No-action:** No impacts. No additional impacts to transportation	**No-action:** No impacts. No increase in current transportation	**No-action:** No impacts. No traffic impacts with current level of activity
	Proposed Action: No adverse impacts. Increase average daily traffic by 1.6 percent	**Proposed Action:** No adverse impacts. Closure of road to Polihale State Park for up to 15 hours per year until 31 December 2030	**Proposed Action:** No impacts. No additional traffic will be generated	**Proposed Action:** No impacts. No additional traffic would be generated	**Proposed Action:** No impacts. No impacts are expected from use of new magazines	**Proposed Action:** No adverse impacts. Additional marine operations would cause a minor increase in traffic
Utilities	**No-action:** No impacts. Current utilities providers meet demands	**No-action:** No impacts per the Restrictive Easement EIS. No additional utilities are required	**No-action:** Adverse impacts to water supply given existing shortage	**No-action:** Adverse impacts to water supply given existing shortage	**No-action:** Not analyzed; see appendix D	**No-action:** No impacts. Current usage levels of utilities are compatible with supply
	Proposed Action: No impacts. Demand created by new personnel can be met by current utilities providers	**Proposed Action:** No impacts. No additional utilities are required	**Proposed Action:** Adverse impacts to water supply given existing shortage	**Proposed Action:** Adverse impacts to water supply given existing shortage	**Proposed Action:** Not analyzed; see appendix D	**Proposed Action:** No impacts. No increase in current demand

Table 2.5-1. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Pacific Missile Range Facility (Page 7 of 7)

Resource Category	PMRF/Main Base	Restrictive Easement	Makaha Ridge	Kokee	Kamokala Magazines	Port Allen
Visual Resources	**No-action:** No adverse impacts. Existing structures are a small part of vistas	**No-action:** No impacts per the Restrictive Easement EIS. New construction precluded that could affect visual character of the area	**No-action:** No adverse impacts. Minimal impact from views from ocean vessels or hunters	**No-action:** No adverse impacts. Existing antennas provide out of character element	**No-action:** No impacts. Does not change any permanent vistas	**No-action:** No impacts. Current use of port is consistent with harbor setting
	Proposed Action: No adverse impacts. New launch facilities could provide out-of-character element; implementation of mitigation measures would minimize impacts	**Proposed Action:** No impacts. Continued use of the Restrictive Easement prevents the construction of elements which would disrupt the visual character of the area	**Proposed Action:** No adverse impact. Potential new radar, building, helicopter pad, and telemetry to stand out in the area	**Proposed Action:** No adverse impacts. New facilities will not be visible to the public; impacts same as the No-action Alternative	**Proposed Action:** No adverse impacts. New storage magazines may provide an out-of-character element; implementation of mitigation measures to minimize impact	**Proposed Action:** No impacts. No changes to the visual environment
Water Resources	**No-action:** No adverse impacts. Emissions from launches and exercises would have a minimal effect on water resources near PMRF/Main Base	**No-action:** No adverse impacts per the Restrictive Easement EIS. No new development would affect water resources	**No-action:** No impacts. No water resources are affected	**No-action:** No impacts. Impacts will be minimal from radars	**No-action:** No adverse impacts. Impacts to water resources are minimal	**No-action:** No impacts. Current operations do not impact water resources
	Proposed Action: No adverse impacts. Slight increase in missile launch emissions would not adversely affect water quality	**Proposed Action:** No adverse impacts. No new development would affect water resources	**Proposed Action:** No impacts. Construction activities would have no impacts to water resources	**Proposed Action:** No impacts. Same as No-action Alternative	**Proposed Action:** No adverse impacts. Impacts to water resources from construction are minimal	**Proposed Action:** No impacts. No additional activities are planned

Table 2.5-2. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Support Sites (Page 1 of 7)

Resource Category	Niihau	Kaula	Maui Space Surveillance System	Kaena Point	Wheeler Network	DOE Sites
Air Quality	**No-action:** No adverse impacts. Infrequent emissions associated with diesel generators; no change in regional air quality	**No-action:** ~~Not analyzed~~No impact; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: No adverse impacts. Increase in air emissions; no change to regional attainment status; proposed missile launch emissions below health base standards beyond ground hazard area	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D
Airspace	**No-action:** No impacts. No impacts to current airspace usage	**No-action:** No impacts. Current activities do not impact airspace concerns	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impacts	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: Adverse impact. Adverse impact on en route airways and jet routes	**Proposed Action:** No impacts. No increase in level of activities	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D

Table 2.5-2. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Support Sites (Page 2 of 7)

Resource Category	Niihau	Kaula	Maui Space Surveillance System	Kaena Point	Wheeler Network	DOE Sites
Biological Resources	**No-action:** No adverse impacts. Minimal impacts to vegetation; impacts to marine mammals minimized through implementation of mitigation measures	**No-action:** No adverse impacts. Impacts to marine species minimized through past Section 7 Consultation with the USFWS	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: Adverse impact. Minor impacts to vegetation from construction or operation; adverse impacts to marine mammals minimized through implementation of mitigation measures	**Proposed Action:** No adverse impacts. Impacts would be the same as No-action Alternative; no increase in activities is proposed	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D
Cultural Resources	**No-action:** No adverse impacts. No cultural assessments have been completed for currently used areas. Most sites are in "built" environment areas. A Section 106 Consultation is needed and mitigations would be identified	**No-action:** No impacts. No cultural resources are known	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: No adverse impacts. Potential impacts from construction and operation reduced through implementation of mitigation measures	**Proposed Action:** No impacts. No increase in activities is proposed	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D

Table 2.5-2. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Support Sites (Page 3 of 7)

Resource Category	Niihau	Kaula	Maui Space Surveillance System	Kaena Point	Wheeler Network	DOE Sites
Geology and Soils	**No-action:** No impacts. No ground disturbance activities occur from PMRF operations	**No-action:** Adverse impact. Permanent and adverse impacts to rock; erosion of soil	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action No adverse impacts. Missile emissions would cause minimal impact to soil chemistry; minor soil erosion from construction	**Proposed Action:** Adverse impact. Same as No-action Alternative	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D
Hazardous Materials and Hazardous Waste	**No-action:** No adverse impacts. Fuel and hazardous materials are managed appropriately; hazardous wastes are removed to PMRF	**No-action:** Not analyzed; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: No adverse impacts. Materials and wastes will be handled according to PMRF procedures	**Proposed Action:** Not analyzed; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D

Table 2.5-2. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Support Sites (Page 4 of 7)

Resource Category	Niihau	Kaula	Maui Space Surveillance System	Kaena Point	Wheeler Network	DOE Sites
Health and Safety	**No-action:** No adverse impacts. Minimal health and safety risk to island residents and workers from PMRF activities **Proposed Action:** No adverse impacts. Increase in health and safety risks to island residents from PMRF activities including the use of liquid propellants; no health and safety impacts expected to island residents.	**No-action:** No adverse impacts. Safety procedures are followed **Proposed Action:** No adverse impacts. Same as No-action alternative	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D
Land Use	**No-action:** No adverse impacts. Current uses are compatible with open land use patterns **Proposed Action:** No adverse impacts. Land uses compatible with PMRF operations; temporary restriction from ground hazard area during missile launching activities for up to 4 hours per year	**No-action:** No adverse impacts. Use of island as target area is compatible with State of Hawaii Sea Bird Sanctuary policies developed for the island **Proposed Action:** No adverse impacts. Same as No-action Alternative	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D

Table 2.5-2. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Support Sites (Page 5 of 7)

Resource Category	Niihau	Kaula	Maui Space Surveillance System	Kaena Point	Wheeler Network	DOE Sites
Noise	**No-action:** No adverse impacts. Current operations are discrete and temporary	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: No adverse impacts. Infrequent noise associated with 8 missile launches per year; noise levels below safety standard outside of ground hazard area.	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D
Socioeconomics	**No-action:** No adverse impacts. Contact minimized through carefully limiting outside contact with residents	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: Increase in beneficial economic impacts; potential increase in cultural impacts mitigated by Navy-Niihau access agreement	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D

Table 2.5-2. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Support Sites (Page 6 of 7)

Resource Category	Niihau	Kaula	Maui Space Surveillance System	Kaena Point	Wheeler Network	DOE Sites
Transportation	**No-action:** No impacts. No traffic on unpaved roads	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: Beneficial impact. Upgrading roads and constructing an airstrip	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D
Utilities	**No-action:** No impacts. Continue to have no regular utilities	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: No impacts. Facilities would be portable and self-contained	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D
Visual Resources	**No-action:** No adverse impacts. Existing facilities provide minimal out-of-character element to the visual environment	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D
	Proposed Action: No adverse impacts. Proposed facilities would provide out-of-character elements to the visual environment	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D	**Proposed Action:** No impact~~Not analyzed~~; see appendix D

Table 2.5-2. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Support Sites (Page 7 of 7)

Resource Category	Niihau	Kaula	Maui Space Surveillance System	Kaena Point	Wheeler Network	DOE Sites
Water Resources	**No-action:** No impacts. No impacts from current PMRF activities **Proposed Action:** No adverse impacts. Construction activities would be subject to NPDES permit process; new launch activities would not exceed water quality standards or result in long-term changes in water chemistry	**No-action:** No impacts. No information relative to water resources **Proposed Action:** No impacts. No additional activities are planned	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D	**No-action:** No impact~~Not analyzed~~; see appendix D **Proposed Action:** No impact~~Not analyzed~~; see appendix D

Table 2.5-3. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Candidate Sites (Page 1 of 3)

Resource Category	Tern Island*	Johnston Atoll*
Air Quality	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No adverse impacts. Increase in air emissions; no change in regional air quality; proposed missile launch emissions below health based standards beyond the ground hazard area	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Increase in air emissions; no change in regional air quality; proposed missile launch emissions below health based standards beyond the ground hazard area
Airspace	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No impacts. Test flight operations would have minimal impacts to airspace	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No impacts. Test flight operations would have minimal impacts to airspace
Biological Resources	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** Adverse impact. Removal of minor amounts of habitat area for seabirds and shore birds; dredging would affect monk seals and coral reefs; construction and operation of missile launch facilities would disturb and displace some monk seals, all minimized though mitigation measures	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impact. Potential impacts to bird species from loss of nesting habitat; noise from missile launches may impact nesting birds and their eggs from startle effects; increase human presence may make birds move from preferred nesting sites; dredging would affect coral reefs; implementation of mitigations would minimize some impacts
Cultural Resources	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No impacts. No historic cultural resources known to exist	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Potential impacts to historic structures from building modifications; implementation of mitigation measures would reduce impacts
Geology and Soils	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No adverse impacts. Construction would cause a low level of erosion and minor chemical deposition	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Potential launch residue in soils

* Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island and Johnston Atoll are no longer reasonable alternatives takes precedence over these other discussions concerning Tern Island and Johnston Atoll in this EIS.

Table 2.5-3. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Candidate Sites (Page 2 of 3)

Resource Category	Tern Island*	Johnston Atoll*
Hazardous Materials and Hazardous Waste	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No adverse impacts. Hazardous materials would be used in accordance with all applicable regulations; hazardous wastes would be remediated or taken back to PMRF	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Hazardous materials would be used in accordance with all applicable regulations; hazardous wastes would be remediated or taken back to PMRF
Health and Safety	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No adverse impacts. Minimal increase in health and safety risk from 4 missile launches per year; mitigation measures would be followed	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Minimal increase in health and safety risk from 4 missile launches per year
Land Use	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No adverse impacts. Required safety zones for missile launching activities would not be compatible with USFWS administrative facilities. USFWS would determine if proposed PMRF operations are compatible with the intended establishment of the Hawaiian Island National Wildlife Refuge	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Required safety zones would not be compatible with NWR designation of the islands. USFWS would determine if proposed PMRF operations are compatible with the intended establishment of the Johnston Atoll National Wildlife Refuge
Noise	**No-action:** No adverse impacts. No current PMRF activities at Tern Island **Proposed Action:** No adverse impacts. Infrequent noise associated with 4 missile launches per year; noise levels below safety standards outside ground hazard area	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Infrequent noise associated with 4 missile launches per year; noise levels below safety standards outside ground hazard area; some personnel on Johnston Atoll may be startled
Socioeconomics	**No-action:** Not analyzed; see appendix D **Proposed Action:** Not analyzed; see appendix D	**No-action:** Not analyzed; see appendix D **Proposed Action:** Not analyzed; see appendix D

* Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island and Johnston Atoll are no longer reasonable alternatives takes precedence over these other discussions concerning Tern Island and Johnston Atoll in this EIS.

Table 2.5-3. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Candidate Sites (Page 3 of 3)

Resource Category	Tern Island*	Johnston Atoll*
Transportation	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** Beneficial impact. New docking facilities	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Additional flights to the island
Utilities	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No adverse impacts. All facilities would be self-contained; wastes would be removed to PMRF	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Any additional needs would be met by portable facilities; wastes would be collected and removed
Visual Resources	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No impacts. Proposed facilities would not be out of character with the existing environment	**No-action:** No impacts. No prominent views are obstructed **Proposed Action:** No impacts. New facilities would match the built character of the islands
Water Resources	**No-action:** No impacts. No current PMRF activities at Tern Island **Proposed Action:** No adverse impacts. New launch activities would not exceed water quality standards or result in long–term changes in water chemistry	**No-action:** No impacts. No current PMRF activities at Johnston Atoll **Proposed Action:** No adverse impacts. Slight turbidity of water due to construction; new launch activities would not exceed water quality standards or result in long-term changes in water chemistry

* Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island and Johnston Atoll are no longer reasonable alternatives takes precedence over these other discussions concerning Tern Island and Johnston Atoll in this EIS.

Table 2.5-4. Summary of Environmental Impacts for the No-action Alternative and Proposed Action, Ocean Area and Environmental Justice

Resource Category	Ocean Area
Airspace	**No-action:** No impacts. Current uses are consistent with airspace usage policies **Proposed Action:** No adverse impacts. Launches will temporarily impact certain airspace usages
Biological Resources	**No-action:** No adverse impacts. Studies on the potential impacts of Navy activities to marine species are underway; as these studies are completed and consultation with the NMFS are developed, Navy activities will comply with the results of the consultation process **Proposed Action:** No adverse impacts. Studies on the potential impacts of Navy activities to marine species are underway; as these studies are completed and consultation with the NMFS are developed, Navy activities will comply with the results of the consultation process
Health and Safety	**No-action:** No impacts. Appropriate safety measures and procedures will be followed **Proposed Action:** No adverse impacts. Test flight operations and training pose potential impacts; minimized through pre-flight planning and issuance of NOTAMs and NOTMARs
Kauai	**No-action:** No adverse impacts. Access temporarily denied to traditional resources within safety areas during missile launch activities; temporary closure of beach areas used for subsistence fishing for up to 15 hours per year; PMRF provides economic benefit to area business within low-income and minority areas **Proposed Action:** No adverse impacts. Same as No-action Alternative
Niihau	**No-action:** No adverse impacts. Impacts from hazardous materials and hazardous wastes would be minimized through using PMRF's safety and handling procedures; minor health and safety risks from current operations are mitigated through advanced planning, standard operating procedures, and remediation capability; minimal noise generated **Proposed Action:** No adverse impacts. Access temporarily denied to subsistence fishing and hunting areas and recreational opportunities for up to 4 hours per year; construction of new facilities would provide a visual out-of-character element on the island; additional funds may provide an economic benefit to some residents; minimum health and safety risks associated with launch operations are minimized through modeling; minor noise from launch activities; temporary soil disturbance due to construction

Ref. No.	Reference	Page #	¶	Line
130	U.S. Army Space and Strategic Defense Command, 1993. *Final Environmental Impact Statement for the Restrictive Easement, Kauai, Hawaii*, October. (Figure 3.1-1)	3-2		
50	Lawshe, J., 1996. Personal communication between James S. Lawshe, Senior Systems Engineer, High Technology Solutions, Inc., and Quent Gillard, EDAW, Inc., regarding comments on the 18 November 1996 DOPAA and including an enclosure of graphics, 10 December. (Figure 3.1-2)	3-4		
148	U.S. Department of Defense, 1991. *Range User's Handbook*, Department of the Navy, Pacific Missile Range Facility Hawaiian Area, Barking Sands, September. (Figure 3.1-3)	3-5		
208	Pacific Missile Range Facility, 1996, January. (Figure 3.1-4)	3-6		
130	U.S. Army Space and Strategic Defense Command, 1993. *Final Environmental Impact Statement for the Restrictive Easement, Kauai, Hawaii*, October. (Figure 3.1-5)	3-7		
219	U.S. Department of the Navy, 1992. *Makaha Ridge, Kauai, General Development Map—Utilities, Main Station, Section One, Electrical Distribution System, Scale 1" = 200', Revised,* Naval Facilities Engineering Command, Pacific Missile Range Facility, Hawaiian Area, 1 March. (Figure 3.1-6)	3-8		
50	Lawshe, J., 1996. Personal communication between James S. Lawshe, Senior Systems Engineer, High Technology Solutions, Inc., and Quent Gillard, EDAW, Inc., regarding comments on the 18 November 1996 DOPAA and including an enclosure of graphics, 10 December. (Figure 3.1-7)	3-9		
164	U.S. Department of the Navy, 1990. *Master Plan PACMISRANFAC HAWAREA, Barking Sands, Kauai, Hawaii,* Pacific Division, Naval Facilities Engineering Command, Facilities	3-10		

Ref. No.	Reference	Page #	¶	Line
	Planning Department, Pearl Harbor, Hawaii, October. (Figure 3.1-8)			
11	Brennan, G., 1996. Personal communication between Lt. Gary F. Brennan, Seaborne Targets Officer, Surface Targets Office, Port Allen, and Quent Gillard, EDAW, Inc., regarding review of 18 November 1996 DOPAA and the Surface Targets Complex, 18 December. (Figure 3.1-9)	3-11		
36	Illman, Paul E., 1993. *The Pilots Air Traffic Control Handbook.* Second Edition, New York: TAB Books. (Figure 3.1.1.2-1)	3-15		
36	Illman, Paul E., 1993. *The Pilots Air Traffic Control Handbook.* Second Edition, New York: TAB Books.	3-16	1	9
4	Aviation Supplies and Academic Inc., 1996. *Federal Aviation Regulation and Aeronautical Information Manual*	3-16	3	9
4	Aviation Supplies and Academic Inc., 1996. *Federal Aviation Regulation and Aeronautical Information Manual*	3-16	4	7
4	Aviation Supplies and Academic Inc., 1996. *Federal Aviation Regulation and Aeronautical Information Manual*	3-17	1	2
148	U.S. Department of Defense, 1991. *Range User's Handbook*, Department of the Navy, Pacific Missile Range Facility Hawaiian Area, Barking Sands, September. (Figure 3.1.1.2-2)	3-18		
70	National Ocean Service, 1997. *Hawaiian Islands Sectional Aeronautical Chart*, 22 May. (Figure 3.1.1.2-3)	3-19		
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142	U.S. Census Bureau, 1998. *1990 Census Data, Database C90STF3A,* [Online]. Available: http://www/census.gov/cdrom/lookup/889651958, [no date]. (Figure 3.5.2-1)	3-197		
142	U.S. Census Bureau, 1998. *1990 Census Data, Database C90STF3A,* [Online]. Available: http://www/census.gov/cdrom/lookup/889651958, [no date].	3-198	1	20
142	U.S. Census Bureau, 1998. *1990 Census Data, Database C90STF3A,* [Online]. Available: http://www/census.gov/cdrom/lookup/889651958, [no date].	3-198	2	17
54	Meyer, Philip A., 1998. *Niihau: Present Circumstances and Future Requirements in an Evolving Hawaii Community A Report to Hoomana Ia Iesu Church of Niihau*, February.	3-199	1	7
54	Meyer, Philip A., 1998. *Niihau: Present Circumstances and Future Requirements in an Evolving Hawaii Community A Report to*	3-199	1	10

Ref. No.	Reference	Page #	¶	Line
	Hoomana Ia Iesu Church of Niihau, February.			
54	Meyer, Philip A., 1998. *Niihau: Present Circumstances and Future Requirements in an Evolving Hawaii Community A Report to Hoomana Ia Iesu Church of Niihau*, February.	3-199	2	3
54	Meyer, Philip A., 1998. *Niihau: Present Circumstances and Future Requirements in an Evolving Hawaii Community A Report to Hoomana Ia Iesu Church of Niihau*, February.	3-199	3	7
54	Meyer, Philip A., 1998. *Niihau: Present Circumstances and Future Requirements in an Evolving Hawaii Community A Report to Hoomana Ia Iesu Church of Niihau*, February.	3-199	4	3
54	Meyer, Philip A., 1998. *Niihau: Present Circumstances and Future Requirements in an Evolving Hawaii Community A Report to Hoomana Ia Iesu Church of Niihau*, February.	3-199	5	2
54	Meyer, Philip A., 1998. *Niihau: Present Circumstances and Future Requirements in an Evolving Hawaii Community A Report to Hoomana Ia Iesu Church of Niihau*, February.	3-200	3	2

3.0 Affected Environment

3.0 AFFECTED ENVIRONMENT

This section describes existing conditions and the environment at each location that may be affected by the No-action Alternative and the Proposed Action. Information is provided to serve as a baseline from which to identify and evaluate changes to the baseline that may result from proposed activities. Sources of data in this section include existing reference materials such as EAs, EISs, and installation master plans, site visits to some locations, and personal contacts.

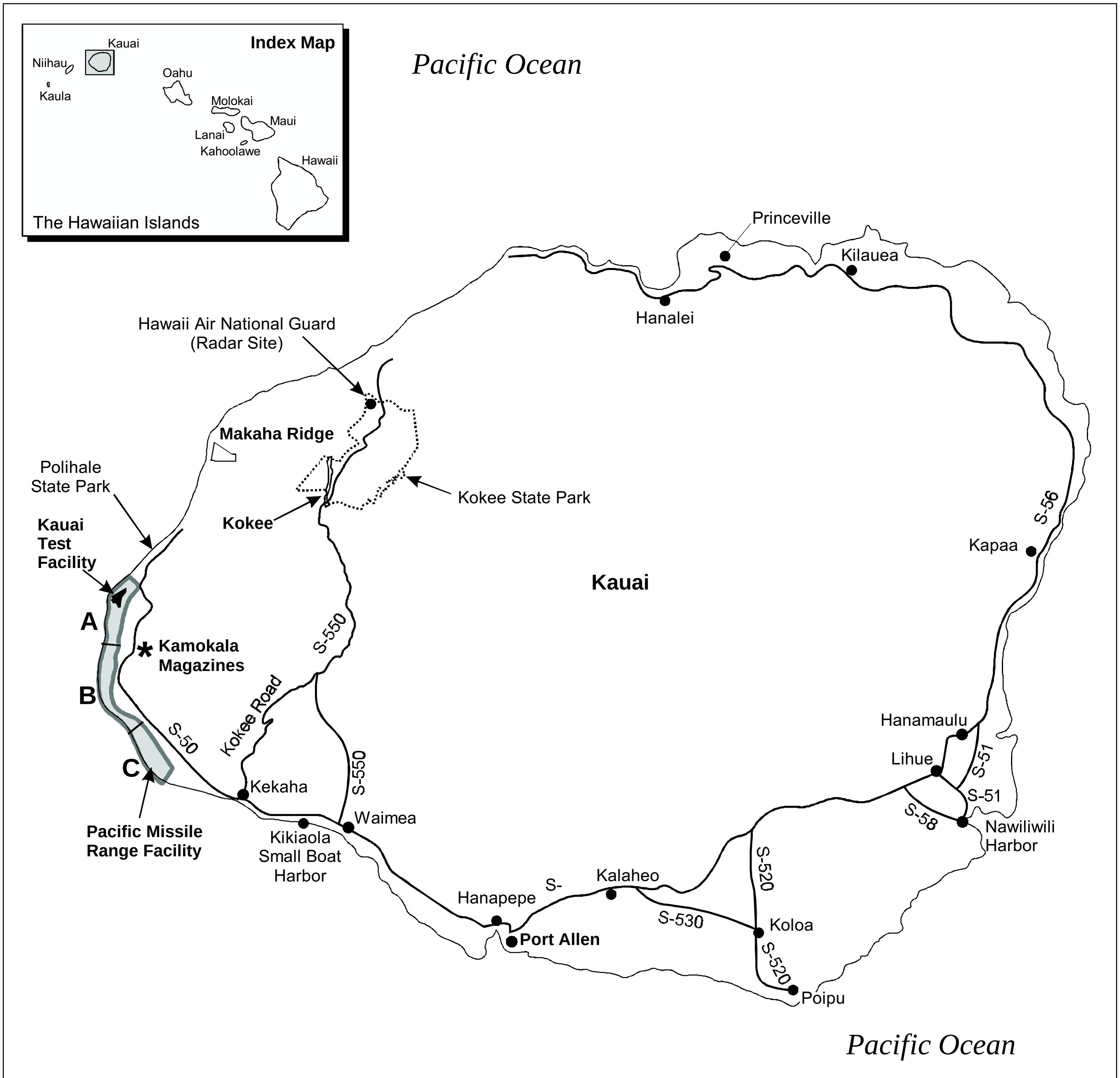
The affected environment is discussed in terms of 1 resource areas: air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise,socioeconomics, transportation, utilities, visual and aesthetic resources, and water resources. In addition, a discussion of the baseline conditions for ocean issues outside the territorial limits of the United States and an Environmental Justice analysis are provided at the end of this chapter. Each resource area is discussed at each location unless the proposed activities at that location would notforeseeably result in an impact. The data presented are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts. Appendix D provides the rationale for not addressing a resource for a given location.

For those resources included in the affected environment, a region of influence will be defined for each affected resource and will determine the geographical area to be addressed as the environmental setting.

Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy toeliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island and Johnston Atoll are no longerreasonable alternatives takes precedence over these other discussions concerning Tern Island and Johnston Atoll in this EIS.

3.1 PACIFIC MISSILE RANGE FACILITY

The main base portion of PMRF is located on the west side of Kauai, approximately 222 km (12 nmi) from Pearl Harbor. The ma ority of PMRF s facilities and equipment are at the main base, which occupies a land area of ha (1, 2 ac) and lies ust south of Polihale State Park (figure 3.1-1). PMRF/Main Base is generally flat and approximately .8 km (. mi) wide and 1 . km (. mi) long with a nominal elevation of . m (1 ft) above mean sea level except for the target launch pad areas.



Source: Modified from U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-2 .

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EXPLANATION

A : See figure 3.1-2
B : See figure 3.1-3
C : See figure 3.1-
S- State Highway
Kokee State Park Boundary

Scale
.1 8.1 Kilometers
2. Miles

NORTH

Pacific Missile Range Facility

Kauai, Hawaii

Figure 3.1-1

pmrf kauai 1

In addition to the PMRF/Main Base, PMRF holds a restrictive easement on 8 ha (2,11 ac) of land ad acent to the facility for safety purposes. The affected environment of this area is described in section 3.1.2. PMRF support facilities on Kauai include Makaha Ridge (.2 ha or 2 ac), Kokee (.3 ha or 22. ac), Kamokala Magazines (3 .2 ha or . ac), and Port Allen (.28 ha or . ac). The nearest community, Kekaha, is about 13 km (8 mi) south of PMRF. See figures 3.1-2 through 3.1- .

Baseline conditions are described for each of the sites associated with the No-action Alternative and the Proposed Action. The regulatory background for each environmental resource is given in appendix J. The PMRF/Main Base discussion includes the description for KTF. All other PMRF support locations are addressed individually.

The overall mission of PMRF is to provide ma or range services for fleet training, tactics development, and test and evaluation of air, space, surface, and subsurface systems.

3.1.1 PMRF/MAIN BASE

3.1.1.1 Air Quality— PMRF/Main Base

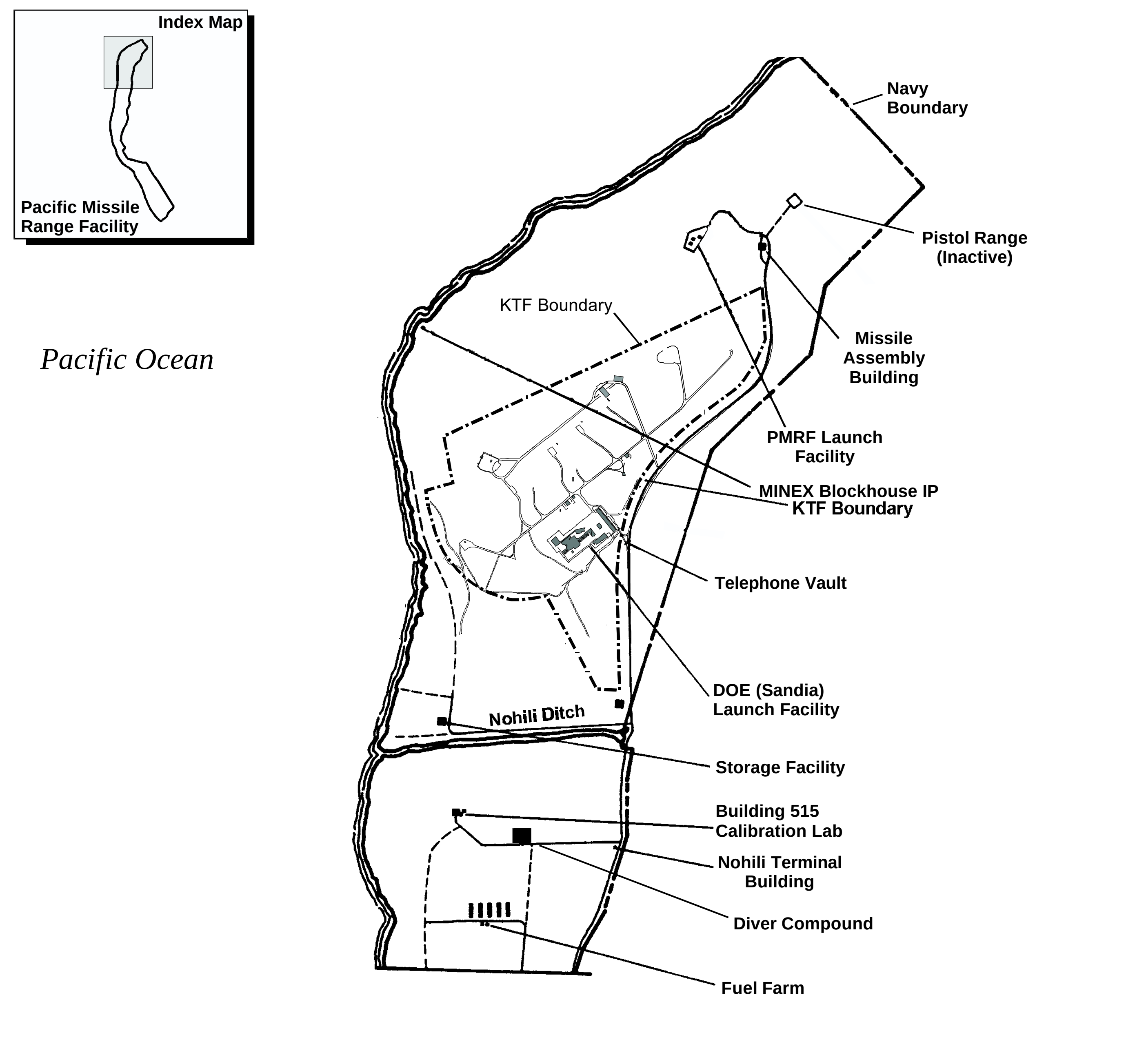
For purposes of this environmental impact analysis, air quality is defined as the concentrations of various pollutants in the atmosphere. This is expressed in terms of either parts per million by volume (parts per million ppm) or mass per cubic meter (milligrams per cubic meter mg/m^3 or micrograms per cubic meter µg/m^3). Actual concentrations of each pollutant vary by the type and amount of airborne emissions, the size and topography of the air basin, and weather conditions.

The affected environment includes that portion of the atmosphere, described both spatially and temporally, anticipated to experience potential impacts from activities associated with the No-action Alternative and the Proposed Action. The affected environment is described in terms of applicable regulations, existing climatology and meteorology, ambient air quality, and emission inventories. Actions occurring outside State and Federal urisdiction are analyzed in accordance with EO 1211 .

3.1.1.1.1 Region of Influence

Identifying the region of influence for an air quality assessment requires knowledge of the pollutant types, source emission rates and release parameters, proximity relationships of pro ect emission sources to other current or anticipated emission sources, and local and regional meteorological conditions. Once this information has been obtained, the region of influence can be determined. There are two distinct regions of influence for air quality: one for photochemically inert pollutants, and the second for photochemically reactive pollutants.

Most air pollutants are photochemically inert. This category includes all criteria pollutants other than ozone and its precursors. The region of influence for inert pollutants is the area in which the pollutant is concentrated enough to have a measurable effect on ambient air quality. These pollutants are generally dispersed within a few kilometers (miles) of the source. As such, the region of influence for inert air pollutants is generally restricted to within a few kilometers (miles) of the source.



Source: Modified from Lawshe, 1 , 1 Dec.

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EXPLANATION

-·-·- KTF Boundary

DOE Department of Energy
KTF Kauai Test Facility
PMRF Pacific Missile Range Facility
MINE Mining Exercises

Pacific Missile Range Facility/Main Base, North

Kauai, Hawaii

NORTH

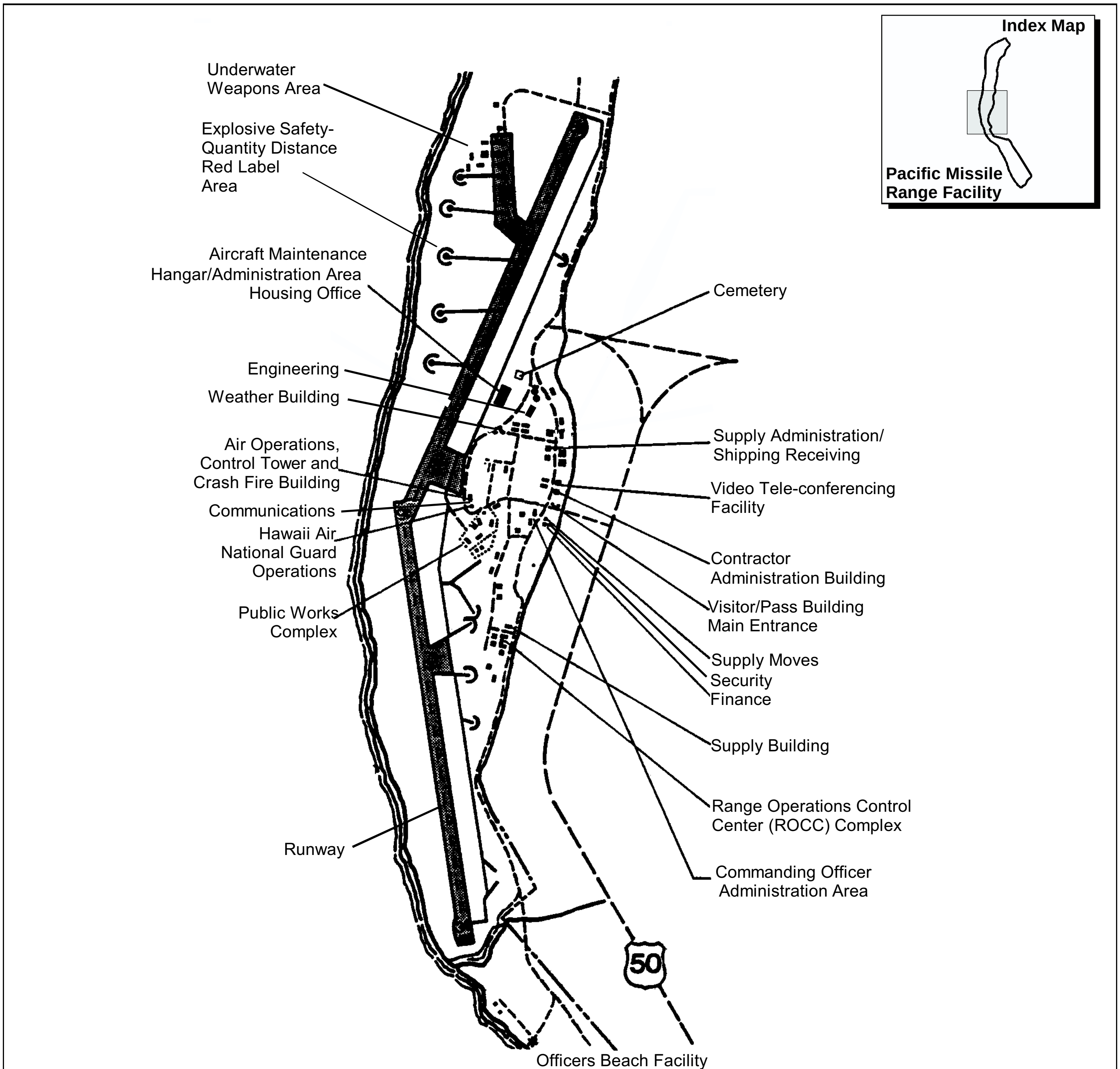
Scale

2 1 1 Meters

1,323 1, Feet

Figure 3.1-2

pmrf main north 1



Source: Modified from U.S. Department of Defense, 1 1, Sep, p. .

Pacific Missile Range Facility/Main Base, Central

Kauai, Hawaii

Figure 3.1-3

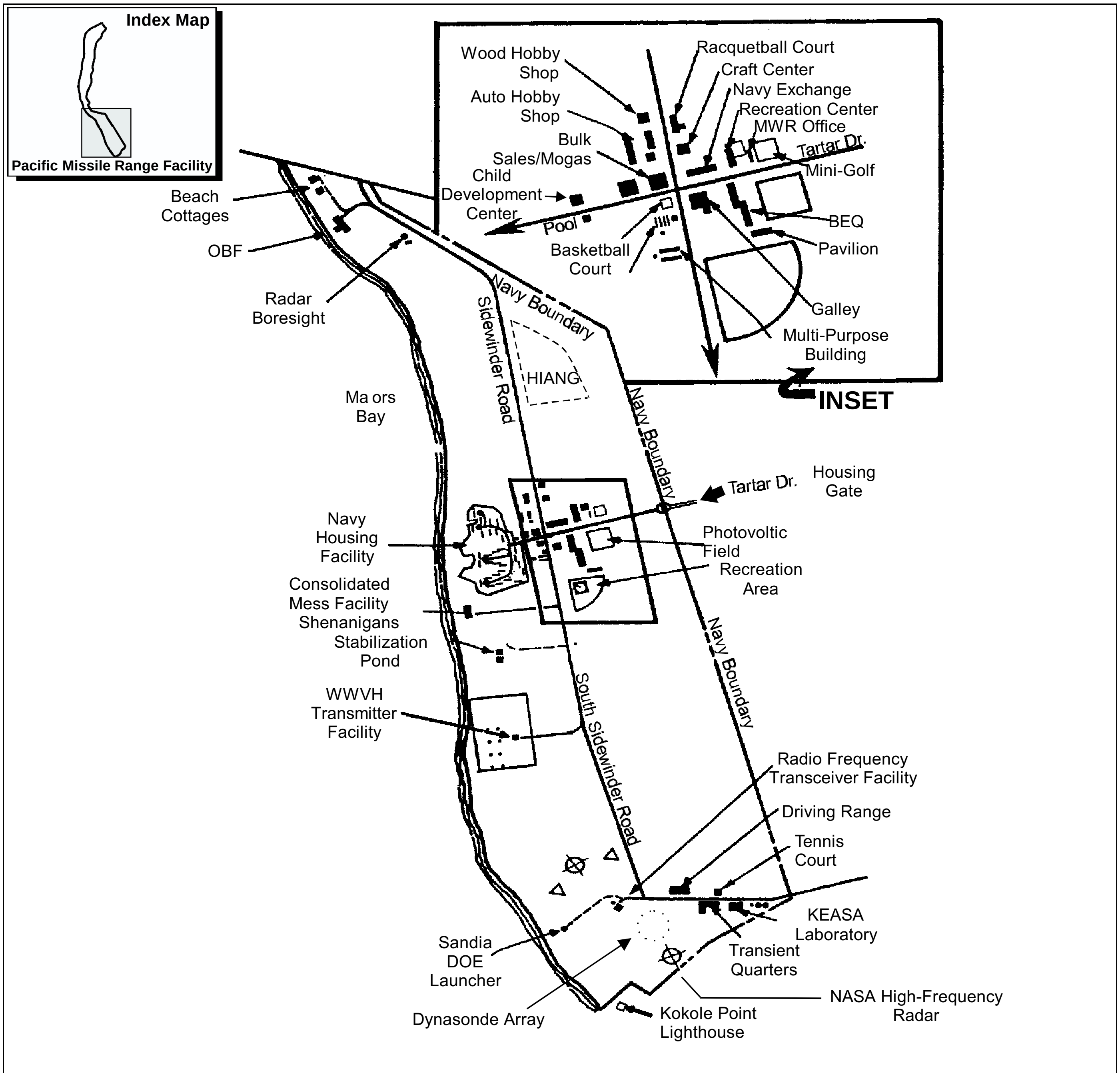
NORTH

Scale

2 8 Meters

1 1, 3 Feet

pmrf main central 1



Source: Modified from Pacific Missile Range Facility, 1 , Dec, p.2.

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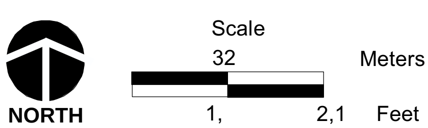
EXPLANATION

BEQ	Bachelor s Enlisted Quarters	OBF	Officer s Beach Facility
DOE	Department of Energy	WWVH	Hawaii Radio Station
HIANG	Hawaii Air National Guard		
KEASA	Kauai Educational Association of Science and Astronomy		
MWR	Morale, Welfare, and Recreation		
MOGAS	Motor Vehicle Gasoline		
NASA	National Aeronautics and Space Administration		

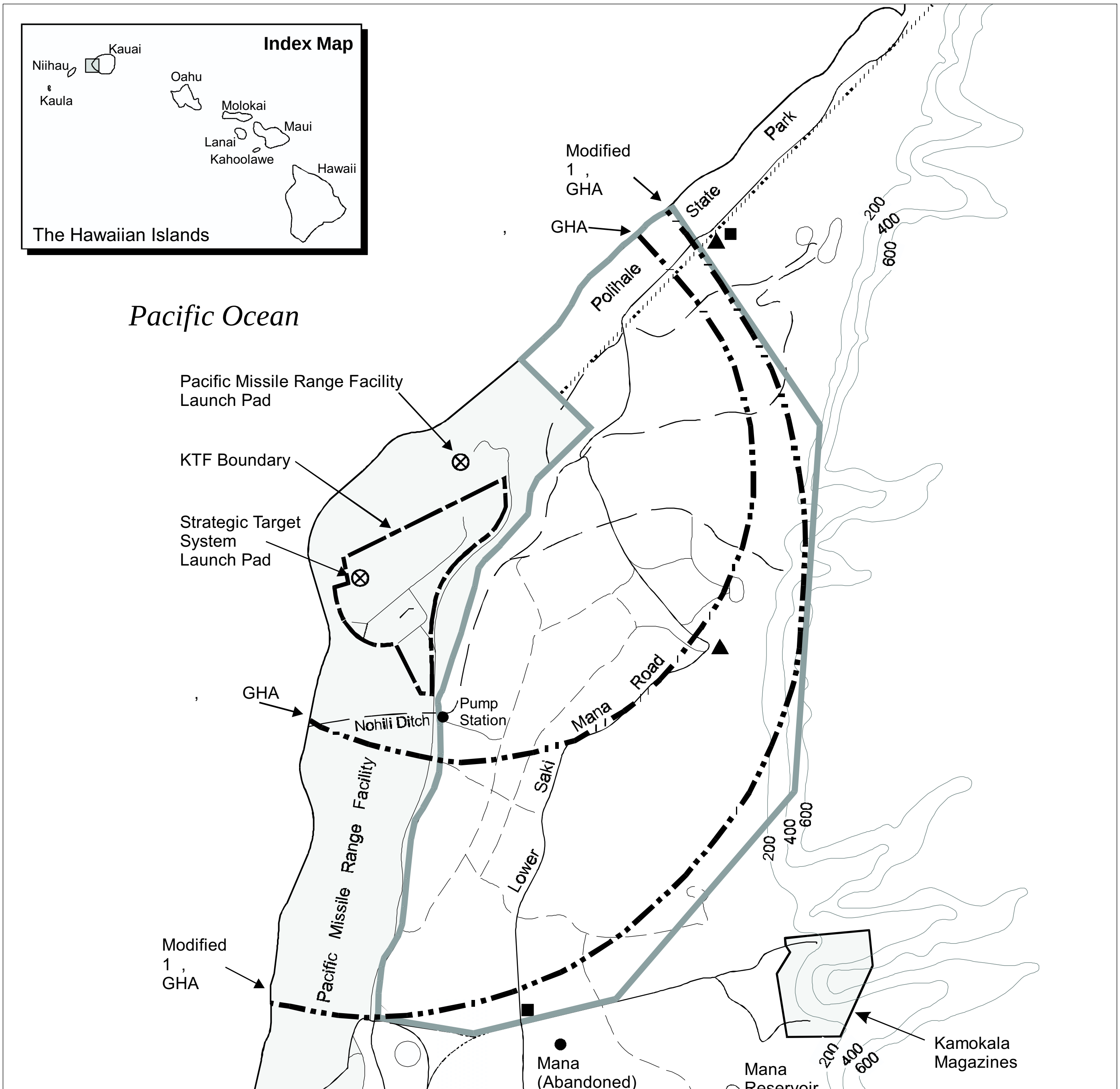


Pacific Missile Range Facility/Main Base, South

Kauai, Hawaii

Figure 3.1-4

pmrf main south 1



Source: Modified from U.S. Army Space and Strategic Defense Command, 1 , Oct, p.3-3 .

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EXPLANATION

Irrigation Drainage Ditch

Approximate Ground Hazard Area Boundary

Restrictive Easement Boundary

Polihale State Park Boundary

2 Contour Lines (ft)

Kauai Test Facility

GHA Ground Hazard Area

Strategic Target System Control Points

Vandal Control Points

Scale

1 Meters

1, 3, Feet

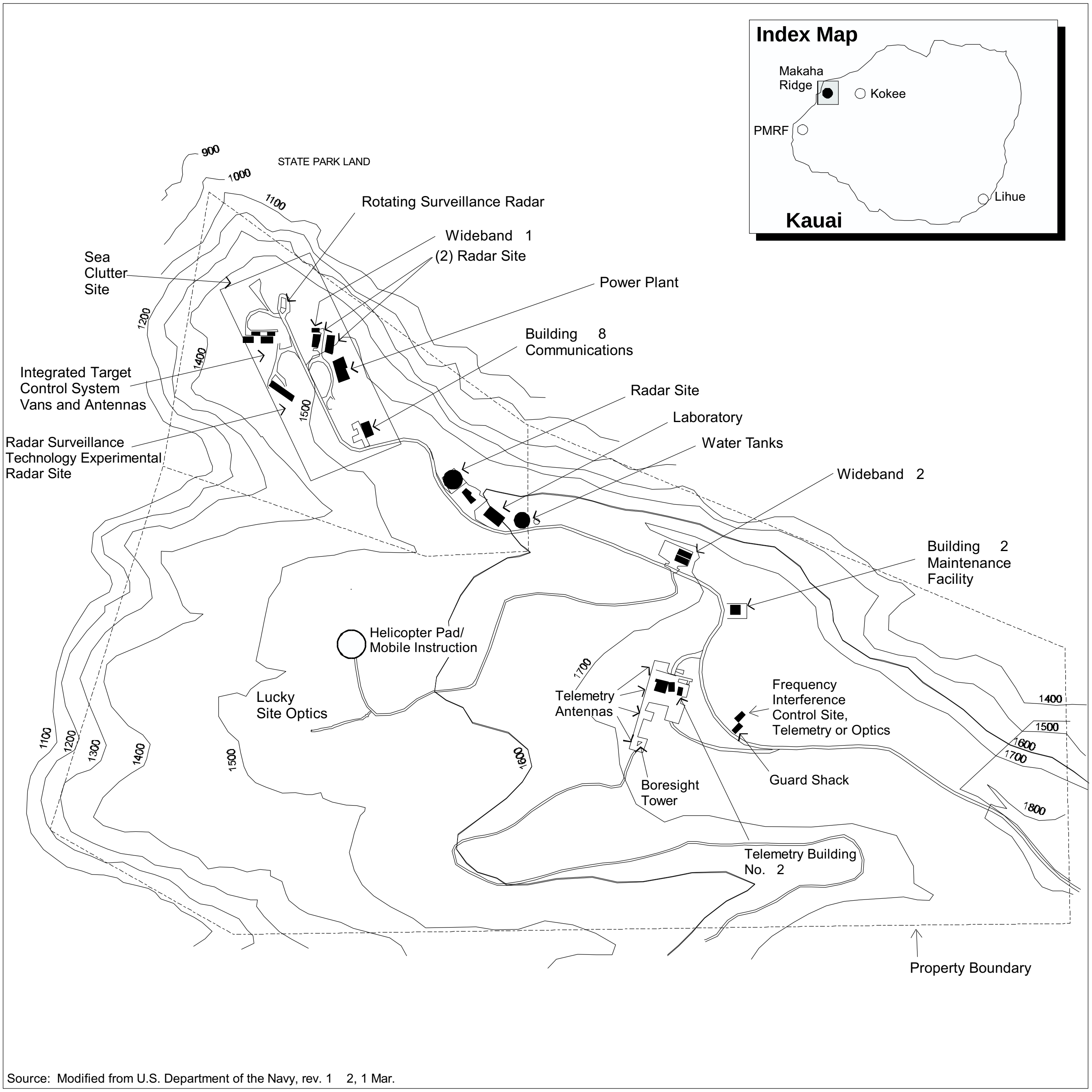
NORTH

Restrictive Easement Boundary and Ground Hazard Area Boundaries (Revised)

Kauai, Hawaii

Figure 3.1-5

pmrf easement 1



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EXPLANATION

Existing Facilities/Landmarks

12 Contour Lines (ft)

Note: All locations are approximate.
PMRF Pacific Missile Range Facility

Scale
2 183 Meters
3 Feet

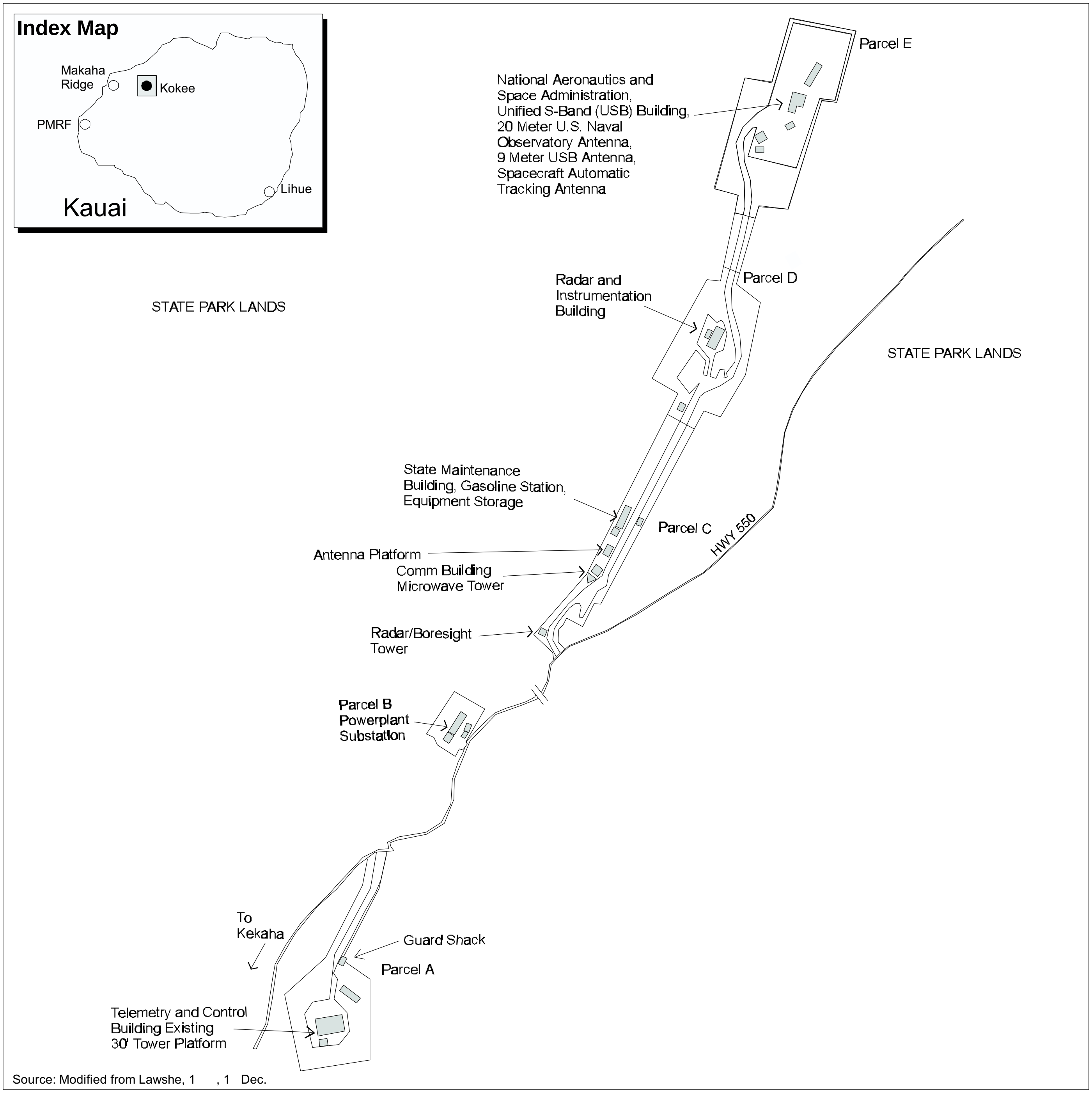
NORTH

Pacific Missile Range Facility/Makaha Ridge

Kauai, Hawaii

Figure 3.1-6

pmrf makaha 1



50

EXPLANATION

Existing Facilities/Landmarks

Note: All locations are approximate.
PMRF Pacific Missile Range Facility

Scale
11 22 Meters
3 2 Feet

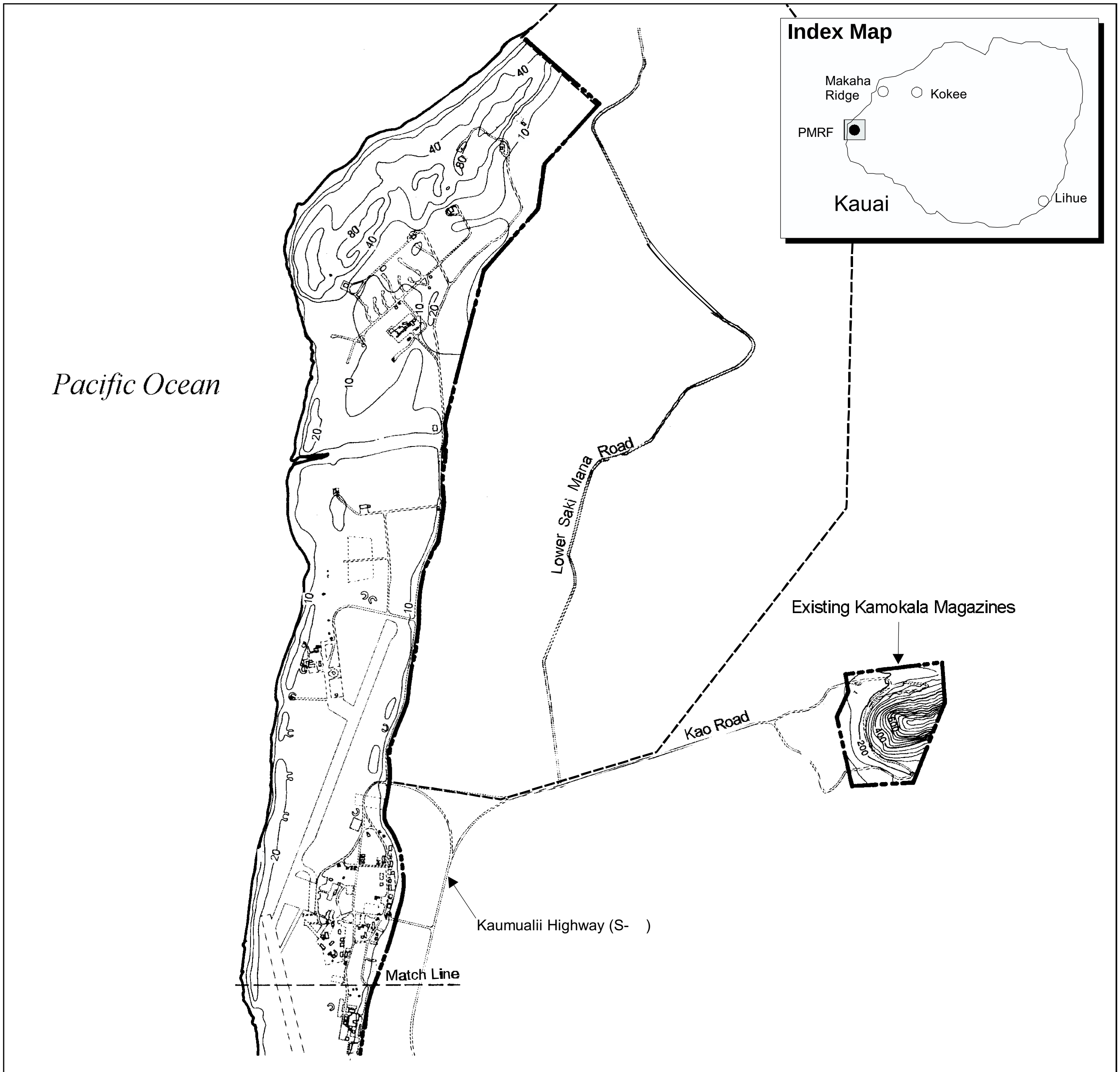
NORTH

Pacific Missile Range Facility/Kokee

Kauai, Hawaii

Figure 3.1-7

pmrf kokee 1



Source: Modified from U.S. Department of the Navy, 1 , Oct, p.11- –11-11.

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EXPLANATION

Contour Lines (ft)

PMRF Boundary

Restrictive Easement Boundary

PMRF Pacific Missile Range Facility

Kamokala Magazines (Revised)

Kauai, Hawaii

Figure 3.1-8

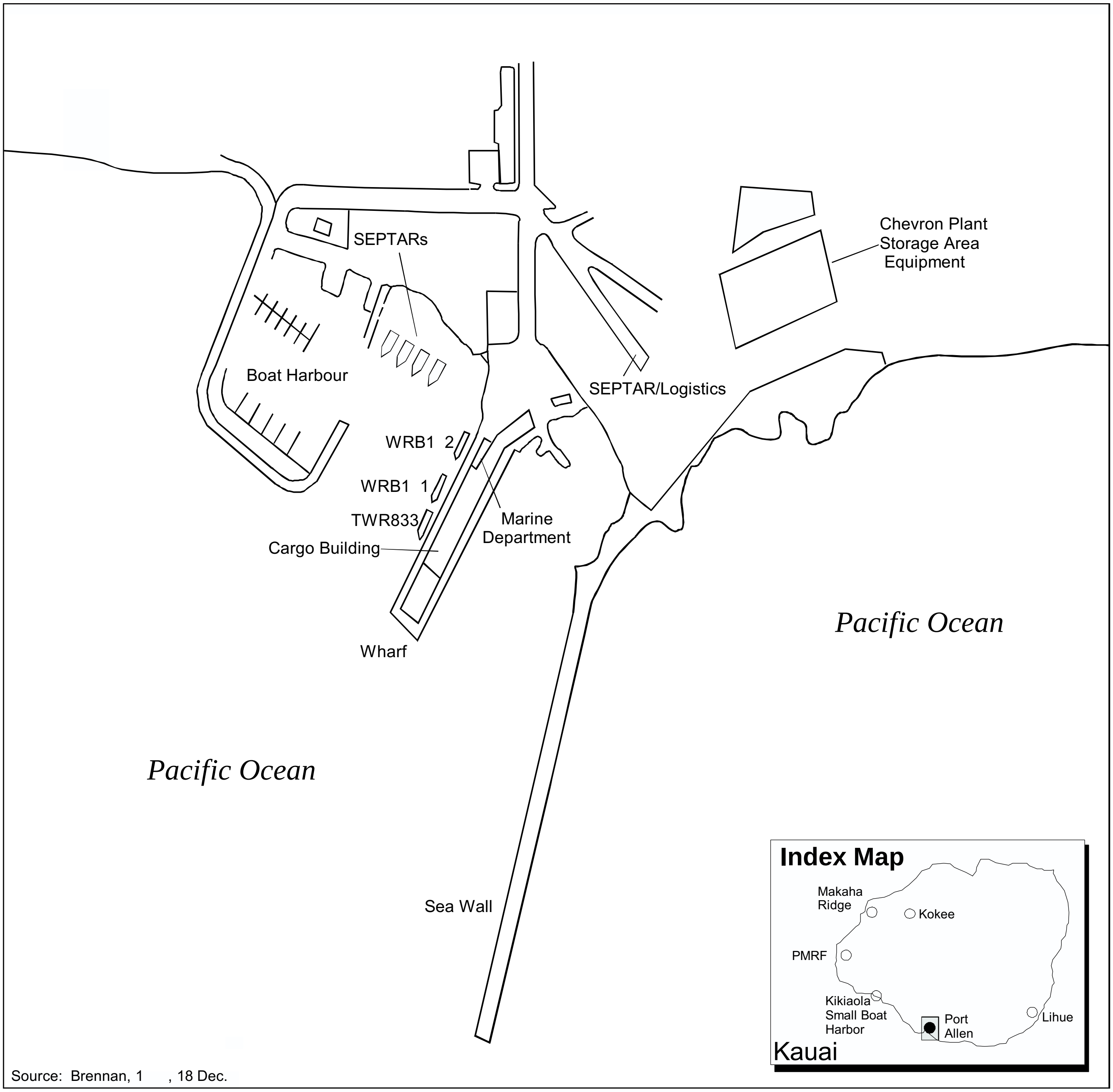
NORTH

Scale

81 Meters

1,3 2, 8 Feet

pmrf kamokala 1



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EXPLANATION

SEPTAR	Seaborne Powered Target
TWR	Torpedo Weapons Recovery
WRB	Weapons Recovery Boat
PMRF	Pacific Missile Range Facility

Port Allen

Kauai, Hawaii

Figure 3.1-9

NORTH

Not to Scale

pmrf allen 1

The second category of air pollutants consists ofphotochemically reactive pollutants. This category is restricted to ozone and its precursors (oxides of nitrogen and reactive organic gases). Due to photochemical reactivity (chemical reactions initiated by sunlight), the ma or effects of the precursor emissions on ozone concentration may not be noticed for several hours after emission. During this time frame, winds, as well as ambient temperatures, will have been changing, making the task of predicting localized ozone concentrations nearly impossible.

Ozone concentrations tend to be regionally distributed because precursor emissions are homogeneously dispersed in the atmosphere. Therefore, the region of influence for photochemically reactive pollutants is the regional area near the source. This is known as the geographic airshed.

For the air quality analysis, the overall region of influence is the existingairshed surrounding the various sites. This region of influence encompasses the effects of both thephotochemically inert and reactive pollutants. For regulatory purposes, pro ect emissions are compared to emissions generated in the appropriate region or county. Where emissions summaries are not available, population density and local industrialization levels are used as tools to characterize the levels of the criteria pollutants. For instance, the Island ofNiihau has approximately 2 inhabitants and no heavy industry. Therefore, it can be anticipated that the air quality onNiihau is at least as good as that experienced on Kauai, which has a similar climate with somewhat greater population density and industry.

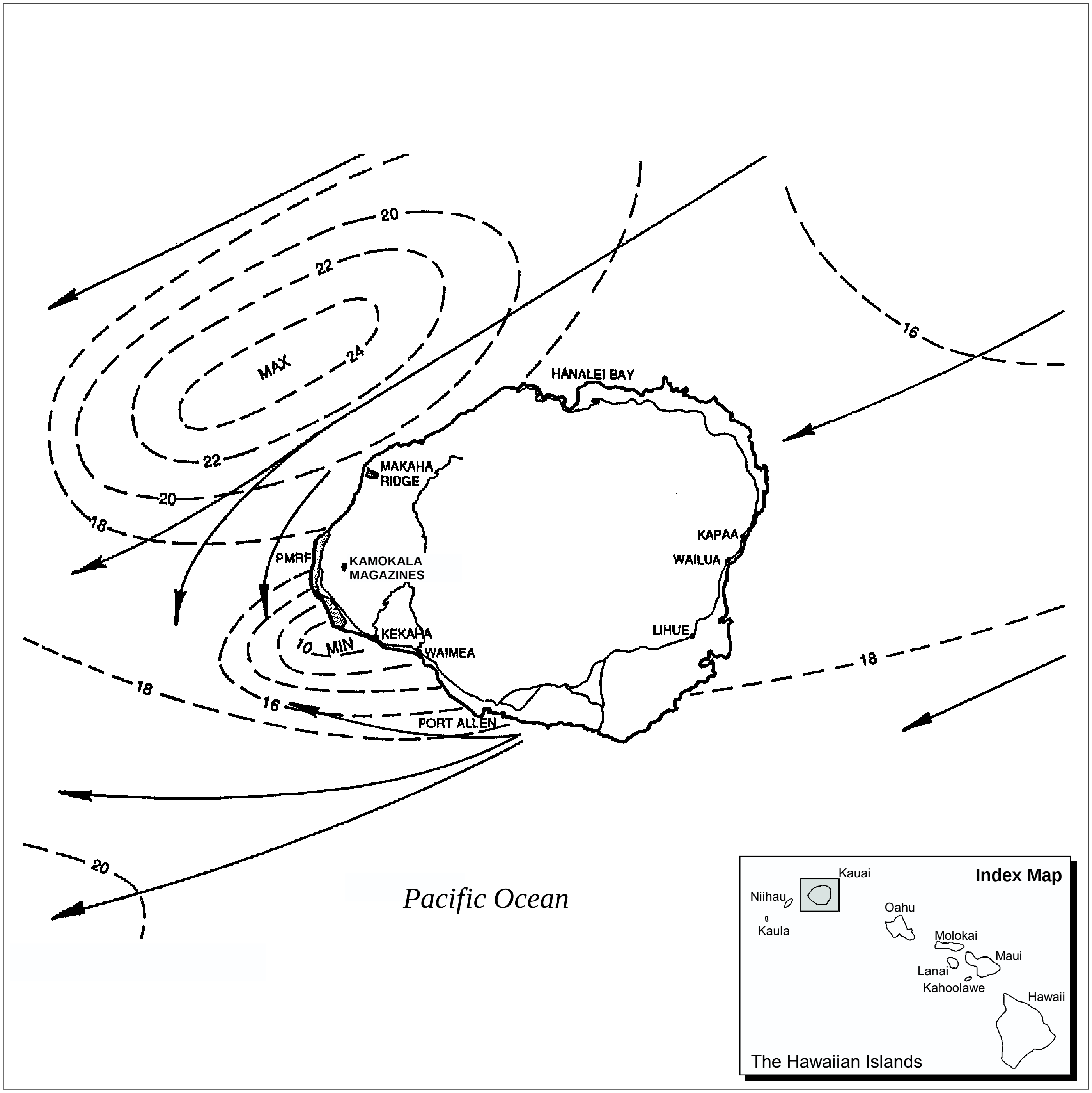
The specific region of influence for each location is refined from the overall region of influence to those areas potentially impacted. The region of influence for the air quality analysis of PMRF/Main Base encompasses the Mana Plain, including PMRF/Main Base and the ground hazard area restrictive easement.

3.1.1.1.2 Affected Environment

3.1.1.1.2.1 Regional Climate

The climate of the Island of Kauai is mild and semitropical, which affects the dispersion of air pollutants and the air quality of the area. The mean annual temperature on theMana Plain is in the 21° to 2 ° Celsius (C) (° to 8 Fahrenheit F) range. Hawaii is located at the edge of the tropical zone within the belt of the cooling northeasterlytradewinds. Northeasterly tradewinds prevail over Kauai during all months of the year. The northeasterlytradewinds, split by the island topography, flow around both sides of the island. Surface winds at PMRF/Main Base are generally light and variable in direction as the zone of convergence of the tradewind flow shifts to the north or south of Kauai. Figure 3.1.1.1-1 shows tradewinds for PMRF/Main Base.

Annual rainfall levels on Kauai range from 1,23 centimeters (cm) (8 inches in.) at the top of Mount Waialeale to approximately 2 cm (2 in.) on the western side of the island, where PMRF is located. The ma ority of the rainfall (percent) occurs during the October through April wet season. Relative humidity is approximately percent during the day in all seasons.



EXPLANATION

Streamlines, Tradewind Conditions
Mean Tradewind Flow

—1 — Windfield, Tradewind Conditions
Mean Tradewind Flow in Knots

PMRF Pacific Missile Range Facility

NORTH

Scale
8. 1 . Kilometers
.2 1 . Miles

Prevailing Winds

Kauai, Hawaii

Figure 3.1.1.1-1

pmrf aq 1

3.1.1.1.2.2 Regional Air Quality

The only sampling station on Kauai is located in Lihue and monitors ~~TSP and~~ for PM-1 . The area is classified as being in attainment for both National and State Ambient Air Quality Standards (AAQS). However, the city of Lihue is 2 km (2 mi) from PMRF and is on the southeast side of the island thus, air quality measurements there may not be representative of air quality at PMRF.

3.1.1.1.2.3 Air Pollution Emissions Sources

The main air pollution sources at PMRF/Main Base are diesel-fuel powered generators, aircraft, and rocket launches. PMRF/Main Base was issued a ~~has a proposed~~ Title V ~~Air~~ Covered Source Permit for five diesel generators on 28 January 1 8~~pending final approval.~~ This Air Permit ~~will~~ covers all significant stationary emissions sources on PMRF/Main Base. It specifically will not cover those outlying areas not contiguous to PMRF/Main Base. Aircraft emissions and missile exhaust emissions are both considered mobile sources and are thus exempt from permitting requirements.

The ma or source of air pollution emissions external to, and not associated with, PMRF/Main Base is the seasonal burning of the cane fields east of the base. This burning produces periods of elevated smoke and ash. In addition, the smoke temporarily degrades visibility over an extended area.

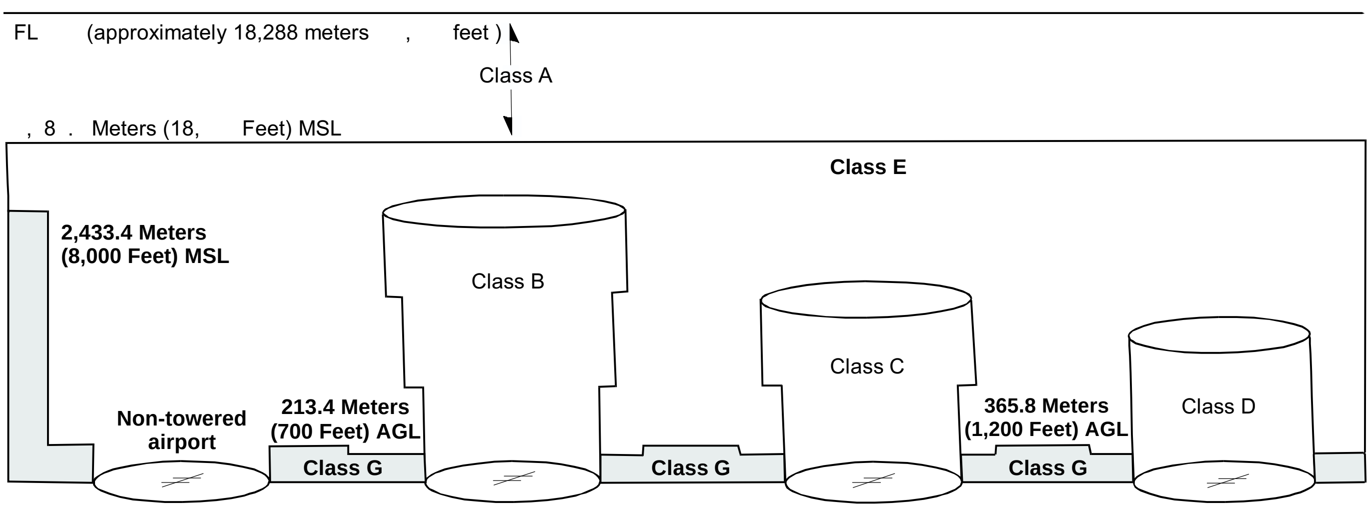
3.1.1.2 Airspace— PMRF/Main Base

Airspace, or that space which lies above a nation and comes under its urisdiction, is generally viewed as being unlimited. However, it is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. The time dimension is a very important factor in airspace management and air traffic control.

Under Public Law (PL) 8 - 2 , *Federal Aviation Act of 1958,* the FAA is charged with the safe and efficient use of our nation s airspace and has established certain criteria and limits to its use. The method used to provide this service is the National Airspace System (NAS). This system is a common network of U.S. airspace air navigation facilities, equipment and services, airports or landing areas aeronautical charts, information and services rules, regulations and procedures, technical information and manpower and material.

Types of Airspace

Controlled and Uncontrolled Airspace. As part of the national airspace system, controlled and uncontrolled airspace is divided into six classes, dependent upon location, use, and degree of control. Figure 3.1.1.2-1 depicts the various classes of controlled airspace. Class A airspace, which is not specifically charted, includes airspace overlying the waters within 22.2 km (12 nmi) of the coast. Unless otherwise authorized, all aircraft must be operated under instrument flight rules (IFR). Class B airspace is generally that airspace surrounding the nation s busiest airports in terms of IFR operations or passenger enplanements. An air traffic control clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace.



Approximate maximum ceilings:
Class B: 2, 33. Meters (8, Feet) AGL
Class C: 1,21 .2 Meters (, Feet) AGL
Class D: 2 Meters (2, Feet) AGL

Source: Illman, 1 3, p. 3 .

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EXPLANATION

AGL	Above Ground Level
FL	Flight Level
MSL	Above Mean Sea Level

The Six Classes of Non-Military Airspace

Figure 3.1.1.2-1

Not to Scale

Class C airspace is generally that airspace surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passengerenplanements. Class D airspace is generally that airspace surrounding those airports that have an operational control tower. Class E airspace is controlled airspace that is not Class A, Class B, Class C, or Class D airspace. Uncontrolled airspace, or Class G airspace, has no specific definition but generally refers to airspace not otherwise designated and operations below 3 .8 m (1,2 ft) above ground level. No air traffic control service to either IFR or Visual Flight Rules (VFR) aircraft is provided other than possible traffic advisories when the air traffic control workload permits and radio communications can be established (llman, 1 3, p. 2). 3

Special Use Airspace. Complementing the classes of controlled and uncontrolled airspace described above are several types of special use airspace used by the military to meet its particular needs. Special use airspace consists of that airspace wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of these activities, or both. Except for controlled firing areas, special use airspace areas are depicted on aeronautical charts. Special use airspace, except controlled firing areas, are charted on IFR or visual charts and include hours of operation, altitudes, and the controlling agency. Only the kinds of special use airspace found in the region of influence are described. These include:

- Restricted Areas contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is sub ect to restriction. Activities within these areas must be confined, because of their nature, or limitations imposed upon aircraft operations that are not a part of these activities, or both. Restricted Areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Restricted Areas are published in the Federal Register and constituteFederal Aviation Regulation (FAR) Part 3 (~~Federal Aviation Regulation and Aeronautical Information Manual~~Aviation Supplies and Academics, Inc., 1 , p.3- -1)

- Warning Areas are airspace that may contain hazards to non-participating aircraft in international airspace. Warning Areas are established beyond the .-km (3-nmi) limit. Although the activities conducted within Warning Areas may be as hazardous as those in Restricted Areas, Warning Areas cannot be legally designated as Restricted Areas because they are over international waters ~~Federal Aviation Regulation and Aeronautical Information Manual,~~ Aviation Supplies and Academics, Inc., 1 , p.3- -1). By Presidential Proclamation No. 28, dated 2 December 1 88~~issued in 1 8~~, the U.S. territorial limit was extended from . to 22.2 km (3 to 12 nmi). Special FAR 3 establishes certain regulatory warning areas within the new (. - to 22.2-km 3- to 12-nmi) territorial airspace to allow continuation of military activities while further regulatory requirements are determined.

Other Airspace Areas. Other types of airspace include airport advisory areas, military training routes, temporary flight restrictions areas, flight limitations and prohibitions areas, parachute ump aircraft operations areas, published VFR routes, and terminal radar service areas (Aviation Supplies and Academics, Inc.~~Federal Aviation Regulation and Aeronautical Information Manual~~, 1 , p.3- -1 through 3- -8).

Special Airspace Use Procedures. Other types of airspace, and special airspace use procedures used by the military to meet its particular needs, include air traffic control assigned airspace and altitude reservation procedures. Both of these are described below:

- Air Traffic Control Assigned Airspace (ATCAA), or airspace of defined vertical and lateral limits, is assigned by air traffic control to provide air traffic segregation between specified activities being conducted within the assigned airspace and other IFR air traffic. ATCAAs are usually established in con unction with Military Operations Areas, and serve as an extension of Military Operations Area airspace to the higher altitudes required. These airspace areas support high altitude operations such as intercepts, certain flight test operations, and air refueling operations.

- ALTRV Procedures are used as authorized by the Central Altitude Reservation Function, an air traffic service facility, or appropriate ARTCC, under certain circumstances, for airspace utilization under prescribed conditions. An ALTRV receives special handling from FAA facilities. According to FAA Handbook 1 . H, Chapter 3, ALTRVs are classified as either moving or stationary, with the latter normally defining the fixed airspace area to be occupied as well as the specific altitude(s) and time period(s) the area will be in use. ALTRVs may encompass certain rocket and missile activities and other special operations as may be authorized by FAA approval procedures.

3.1.1.2.1 Region of Influence

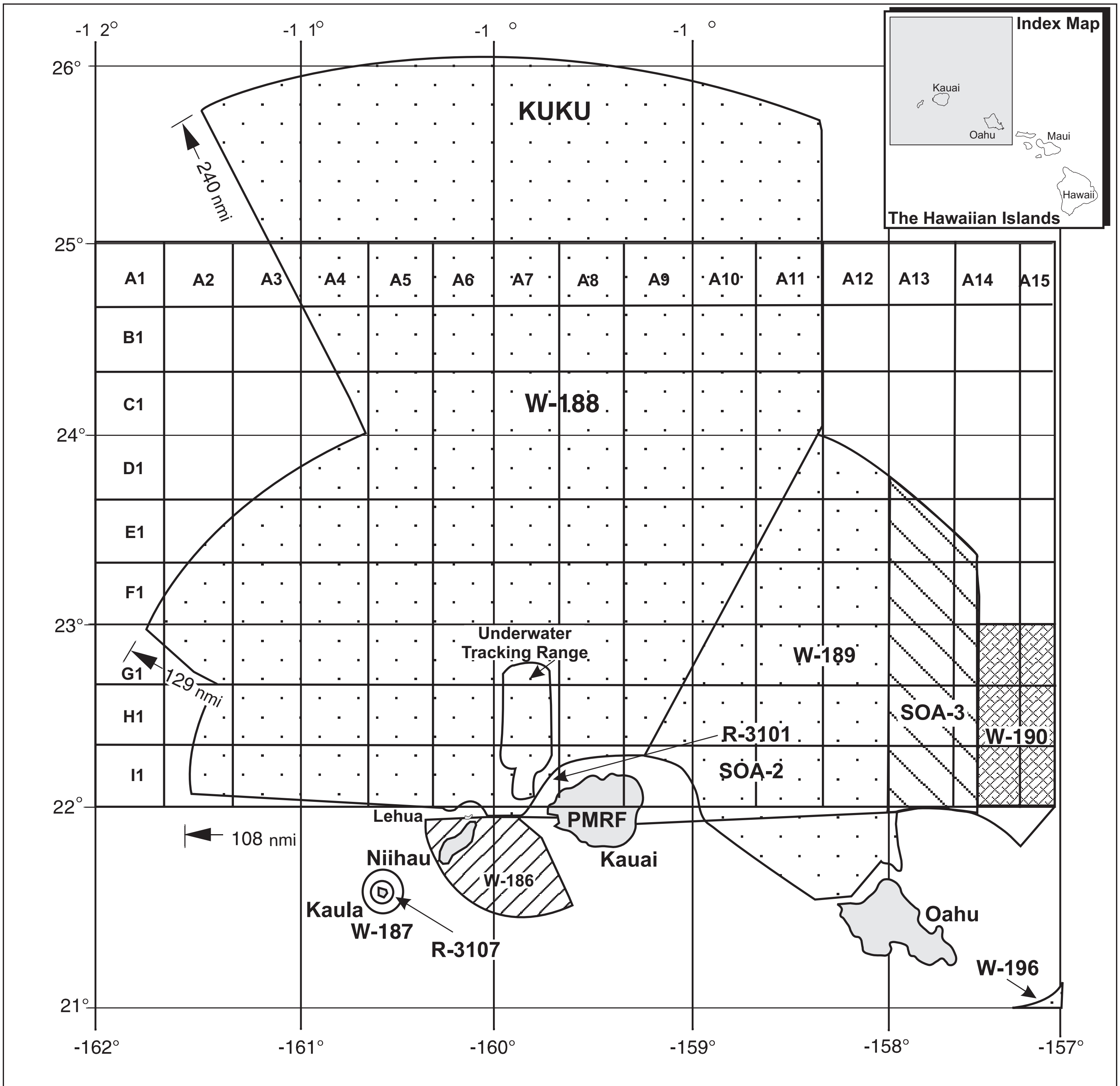
The region of influence, shown in figure 3.1.1.2-2, is defined as the area affected by the ongoing No-action Alternative, and which also would be potentially affected by the Proposed Action, that would utilize portions of the NAS and/or international airspace. Figure 3.1.1.2-3 shows a close-up view of the airspace immediately surrounding PMRF/Main Base.

3.1.1.2.2 Affected Environment

The affected airspace use environment in the PMRF region of influence is described below in terms of its principal attributes: controlled and uncontrolled airspace, special use airspace, en route airways and et routes, airports and airfields, and air traffic control. There are no military training routes in the ROI.

3.1.1.2.2.1 Controlled and Uncontrolled Airspace

The airspace outside the special use airspace identified below is essentially international airspace controlled by Honolulu and OaklandARTCCs. Class D airspace surrounds the PMRF/Main Base airfield with a ceiling of 2 m (2, ft). It is surrounded to the north, south, and east by Class C~~E~~ airspace with a floor 213 m (ft) above the surface (see figure 3.1.1.2-3).



Source: U.S. Department of Defense, 1 1, Sep, p.32.

EXPLANATION

W-188/W-18 /W-1

W-18

SOA-3

W-1

PMRF Pacific Missile Range Facility
R Restricted
SOA Special Operating Area
W Warning Area

NORTH

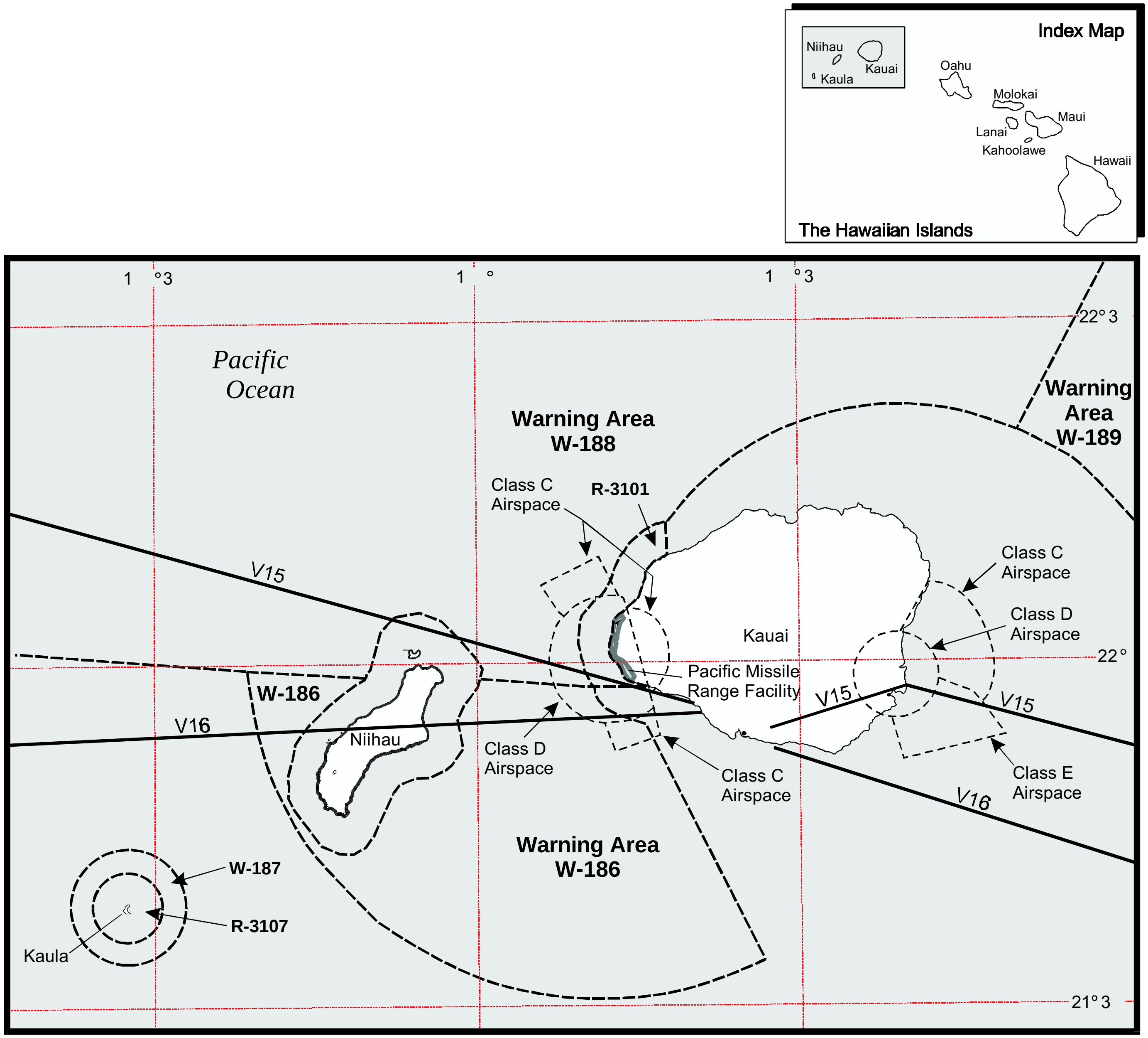
Scale
3 Kilometers
23 Miles

Pacific Missile Range Facility Operational Areas

Open Ocean

Figure 3.1.1.2-2

pmrf as 1



Source: National Ocean Service, 1 , Hawaiian Islands Sectional Aeronautical Chart, May 22.

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EXPLANATION

—— En Route Low Altitude Airways

Scale

13. 2 Kilometers

8. 1 Miles

NORTH

Airspace Use Region of Influence Immediately Surrounding Pacific Missile Range Facility/ Main Base

Hawaii

Figure 3.1.1.2-3

pmrf as 2

No Class B (U.S. terminal control areas) airspace, which usually surrounds the nation s busiest airports, Class E, or Class G (uncontrolled) airspace is found in the region of influence.

3.1.1.2.2.2 Special Use Airspace

The special use airspace in the region of influence (see figure 3.1.1.22) consists of Restricted Area R-31 1 which lies immediately above PMRF/Main Base and to the west of Kauai, portions of Warning Area W-188 north of Kauai, and Warning Area W-18 southwest of Kauai, all controlled by PMRF. Warning Areas W-18 and W-1 north of Oahu and W-18 surrounding Kaula are scheduled through the Fleet Area Control and Surveillance Facility.

Restricted Area R-31 over Kaula, a small uninhabited rocky islet 3 km (1 nmi) southwest of Niihau (see figure 3.1.1.2-3) that is used for helicopter gunnery practice, and which lies within the W-18 Warning Area, is also special use airspace within the region of influence.

By Presidential Proclamation No. 28, the U.S. territorial limit was extended from . to 22.2 km (3 to 12 nmi). Special FAR SFAR 3-1, *Establishment of Warning Areas in the Airspace Overlying the Waters Between 2 and 12 Nautical Miles from the United States Coast,* establishes a Warning Area in the same location as non-regulatory Warning Areas previously designated over international waters within the new (. - to 22.2-km 3- to 12-nmi) territorial airspace to allow continuation of military activities while further regulatory requirements are determined.

Table 3.1.1.2-1 lists the affected Restricted Areas and Warning Areas and their effective altitudes, times used, and their manager or scheduler. There are no Prohibited or Alert special use airspace areas in the PMRF airspace use region of influence.

Table 3.1.1.2-1: Special Use Airspace in the PMRF/Main Base Airspace Use Region of Influence

Number	Location	Altitude (Ft)	Time of Use: Days	Time of Use: Hours	Controlling Agency
R-31 1	PMRFAC FOUR	To Unlimited	M-F	-18	HN CERAP
R-31	Kaula	To FL 18	M-F	-22	HN CERAP
			S-Su	8 -1	
W-18	Hawaii	To ,	Cont[1]	Cont[1]	HN CERAP
W-18	Hawaii	To 18,	M-F	-22	HN CERAP
			S-Su	8 -1	
W-188	Hawaii	To Unlimited	Cont[1]	Cont[1]	HN CERAP
W-18	Hawaii	To Unlimited	M-F	-22	HN CERAP
			S-Su	8 -1	
W-1	Hawaii	To Unlimited	M-F	-22	HN CERAP
			S-Su	8 -1	

[1]Cont Continuous
R-Restricted, W-Warning
FL Flight Level (FL 18 18, ft)
HN Honolulu
CERAP Combined Center Radar Approach Control
Source: National Ocean Service, 1 . 70

3.1.1.2.2.3 En Route Airways and Jet Routes

Although relatively remote from the ma ority of et routes that crisscross the Pacific, the airspace use region of influence has two IFR en route low altitude airways used by commercial air traffic that pass through the region of influence: V1 , which passes east to west through the southernmost part of Warning Area W-188, and V-1 , which passes east to west through the northern part of Warning Area W-18 and over Niihau (see figure 3.1.1.2-3). An accounting of the number of flights using each airway is not maintained.

The airspace use region of influence, located to the west, northwest, and north of Kauai, is far removed from the low altitude airways carrying commercial traffic between Kauai and Oahu and the other Hawaiian islands, all of which lie to the southeast of Kauai (National Ocean Service, 1 , 22 May). There is a high volume of island helicopter sightseeing flights along the Na Pali coastline and over the Waimea Canyon, inland and to the east of PMRF, particularly out of Port Allen near Hanapepe on Kauai s southern coastline and other tourist and resort towns on the island. However, these do not fly over PMRF or into Restricted Area R-31 1 (National Ocean Service, 1 , 22 May).

3.1.1.2.2.4 Airports and Airfields

With the exception of the airfield at PMRF/Main Base, and the Kekaha airstrip approximately .8 km (3 mi) to the southeast of PMRF and 3.2 km (2 mi) northwest of Kekaha, there are no airfields or airports in the airspace use region of influence. In addition to helicopter and fixed-wing aircraft landings associated with PMRF s mission, the PMRF airfield serves as a training facility for landings and takeoffs. The overall number of air operations averaged 1 , 1 over the -year 1 2-1 period, but dropped from 18,2 in F 2 to 12,33 in F .

There is a heliport, used by PMRF personnel, located at the Makaha Ridge Instrumentation Site, as well as a heliport at Kokee Park used by State Park personnel. The standard instrument approach and departure procedure tracks for Kauai s principal airport at Lihue are all to the east and southeast of the island itself, well removed from the airspace use region of influence. (U.S. Department of Commerce and U.S. Department of Defense, 1 3, Jan, p.118 through 123) 1

3.1.1.2.2.5 Air Traffic Control

Utilization of the airspace by the FAA and PMRF is established by a Letter of Agreement between the two agencies. By this agreement PMRF is required to notify the FAA by 2: p.m. the day before range operations would infringe upon the designated airspace. Range Control and the FAA are in direct real-time communications to ensure safety of all aircraft using the airways and et routes and the special use airspace. Within the special use airspace, military activities in Warning Areas W-18 and W-188 are under PMRF control, and the PMRF Range Control Officer is solely authorized and responsible for administering range safety criteria, the surveillance and clearance of the range, and the issuance of range RED (no firing) and GREEN (clearance to fire) status (Pacific Missile Range Facility, Barking Sands, Hawaii, 1 1, 1 Apr, p.11 through 12). Warning Areas W-18 , W-18 , and W-1 are scheduled through 18 the Fleet Area Control and Surveillance Facility.

As Warning Areas are located in international airspace, the procedures of the International Civil Aviation Organization (ICAO), outlined in ICAO Document , *Rules of the Air and Air Traffic Services*, are followed. ICAO Document is the equivalent air traffic control manual to FAA Handbook 11 . , *Air Traffic Control*. The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the region of influence is managed by the Honolulu and Oakland ARTCCs.

3.1.1.3 Biological Resources— PMRF/Main Base

Biological resources include two ma or categories: vegetation and wildlife. In this analysis, biological resources are further categorized as terrestrial and marine species.

3.1.1.3.1 Region of Influence

The region of influence for biological resources includes the area within the PMRF/Main Base property boundary and offshore areas used for training. Within the region of influence, human activities have altered most of the natural terrestrial environment. The land in PMRF/Main Base is used for military activities such as aircraft operations, rocket launches, various training, and base maintenance operations. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1). 13

3.1.1.3.2 Affected Environment

3.1.1.3.2.1 Terrestrial

Flora

The vegetation on PMRF/Main Base is composed of two principal habitat types: ruderal vegetation and kiawe (*Prosopis pallida*)/koa haole (*Leucaena leucocephala*) scrub. The ruderal vegetation on areas of PMRF/Main Base used for launch operations is mowed regularly. The vegetation ad acent to PMRF/Main Base in the ground hazard area is dominated by sugar cane, ruderal vegetation, and wetlands associated with agricultural ponds and drains. Wetlands are also associated with the Mana base pond and Kawaiele wildlife sanctuaries, and agricultural drains within PMRF/Main Base. Kiawe/koa haole scrub and ruderal vegetation are the dominant vegetation in the undeveloped portions of the PMRF/Main Base region of influence. Within PMRF/Main Base and the KTF area of the complex, ruderal vegetation is present where the natural vegetation has been disturbed by man. Much of the ruderal vegetation is mowed on a regular basis. Kiawe/koa haole scrub is dominated by the non-native, naturalized, woody species kiawe and koa haole. The understory, when present, consists of naturalized shrub and herbaceous species such as lantana (*Lantana camara*) and Guinea grass (*Panicum maximum*). Other introduced species are present beneath the kiawe in smaller numbers. Clearings in the kiawe are dominated by patchy, non-native, herbaceous species. In the south central part of PMRF/Main Base, mosaic-like patches of vegetation dominated by the indigenous species *Dodenaea viscosa* are present on a sandy substrate. Ruderal vegetation, primarily composed of herbaceous, non-native species, is characteristic of disturbed areas, although native species may be present. Coastal dune vegetation covers much of the dunes north of KTF, and a well-developed native strand community exists along the shoreline.

Fauna

Forty species of birds have been identified at PMRF/Main Base, including non-native and migratory birds and species endemic to Hawaii. Non-native bird species on Kauai are usually common field and urban birds. Several species of migratory waterfowl may be present during some portion of the year.

The Laysan albatross (*Diomedea immutabilis*), a migratory bird protected under the Migratory Bird Treaty Act, uses ruderal vegetation areas for courtship and nesting. Six pairs of Laysan albatross were observed in the KTF area during a field survey for the Strategic Target System program in 1 (U.S. Army Strategic Defense Command, 1 , Jul). The Laysan albatross is 13
being discouraged from nesting at PMRF/Main Base to prevent interaction between the species and aircraft using the runway. This action is being accomplished under USFWS permit.

The ring-necked pheasant (*Phasianus colchicus*) is one of several non-native game birds that occur throughout the PMRF/Main Base region of influence. The other introduced, or exotic, species are generally common field and urban birds. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-11) 13

Feral dogs (*Canis familiaris*) and cats (*Felis catus*) occur in the region and prey on native and introduced species of birds. Rodents including the Polynesian black rat (*Rattus exulans*), Norway or brown rat (*Rattus norwegicus*), and the house mouse (*Mus musculus domesticus*) are also known to occur in the region. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-11) 13

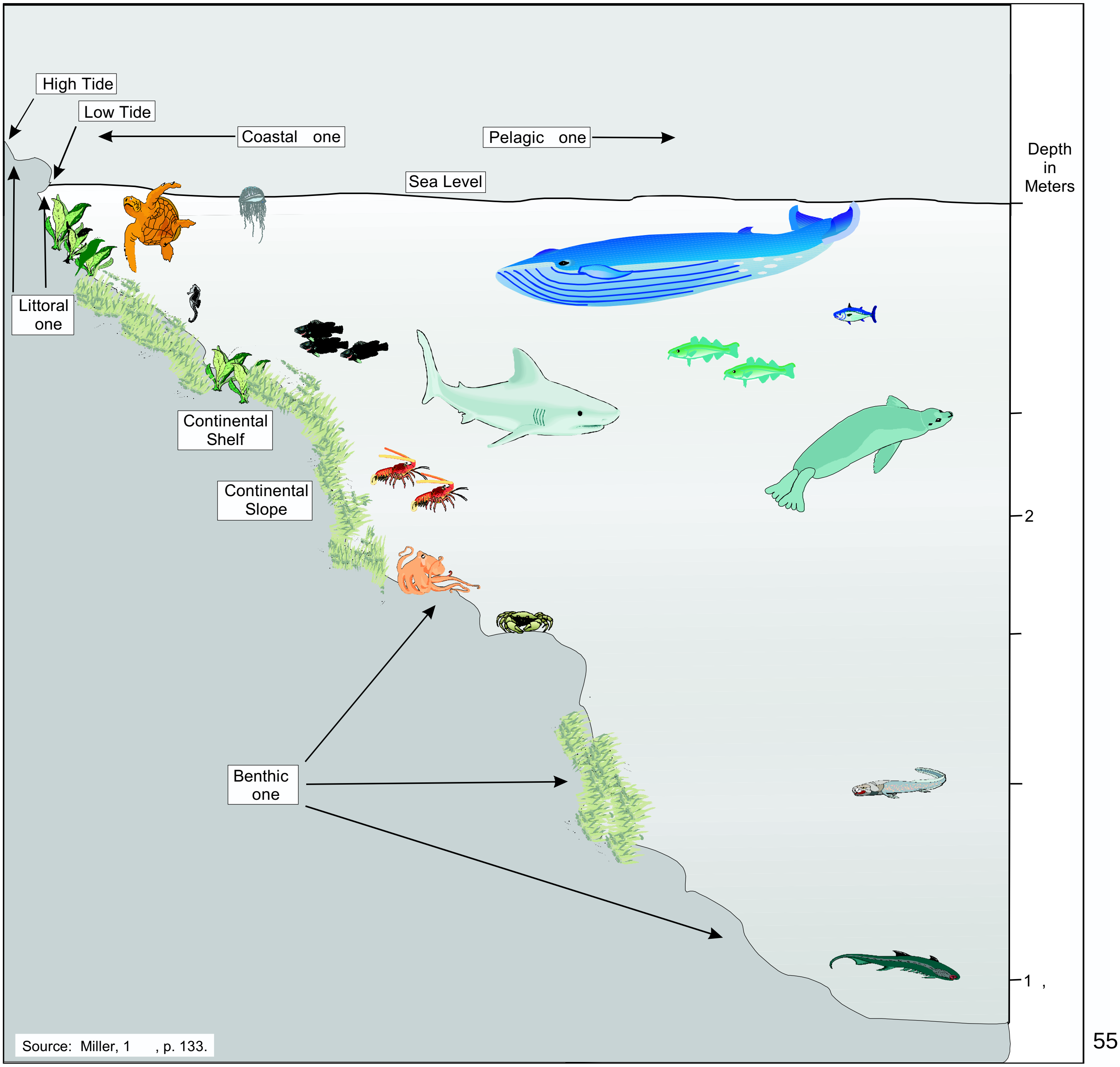
3.1.1.3.2.2 Marine

There are four ma or divisions or zones within the marine environment: the littoral zone, coastal zone, the offshore zone, and the pelagic zone. Spanning over all zones is the benthic environment or sea floor (figure 3.1.1.3-1). This section discusses the littoral, coastal, and offshore zones. Section 3.1.3 discusses the pelagic zone and the benthic environment.

Littoral Zone

The littoral zone is found closest to the coastal fringe and thus only occurs in shallow depths
(Waller, 1 , p. 3). It occupies the space between high and low tide, and is often referred to 18
as the intertidal zone (Waller, 1 , p.). It is a habitat of physical extremes, changing from 18
aquatic to terrestrial as the tide goes out, twice a day (Brewer, 1 88, p. 3). Intertidal areas 12
have the largest fluctuations of environmental conditions when compared to any other ocean zone. Organisms occupying this area must be able to endure fluctuations of temperature,
salinity, oxygen, and pH. (Waller, 1 , p.). Two distinct types of intertidal habitats are 18
rocky, and sandy and muddy shores, which are moderately diverse and low diversity systems,
respectively (Thorne-Miller Catena, 1 1, p. 3 through). 12

Rocky shores are composed of rock, gravel, cobbles, and pebbles. They support a large variety of plant and animal life, each specialized to its own level with respect to the low



Ocean Zones

Open Ocean

Figure 3.1.1.3-1

Not to Scale

water mark (Arms and Camp, 1 8 , p. 1). Many of the organisms of the rocky shore are 3
permanently attached to the rocky surfaces or sessile (Brewer, 1 88, p. 3). Some use a large 12
sucking foot (e.g., limpets and anemones), cemented plates (e.g., barnacles), and cemented
byssal threads (e.g., mussels) (Waller, 1 , p.) to attach to rock substrates. Other 18
organisms that are attached to the rock surfaces, crevices, or in the masses of brown and red
algae, include snails, oysters, chitons, and sea urchins. The littoral fauna are mostly gill-
breathers, but are well adept at avoiding desiccation during tidal fluxes (i.e., drying out) most
have a shell-like structure that helps protect against water loss and predation when the tide is
out. (Brewer, 1 88, p. 3 through 3) Also, their thick and impervious shells or plates protect 12
them from the wave action endemic to their harsh environment (Waller, 1 , p.). 18

~~Both sandy and muddy shores have unstable compositions. This is due to the particulate nature of their constitution. Sandy shores primarily consist of mineral silica of typical sand grain proportions. Muddy shores consist of organic material mixed with silt and clay particles to form what is known as mud. (Waller, 1 , p.) Both of these areas support similar organisms. Because attachment to sand and mud is not possible, the organisms burrow for their protection from predation and the elements, as well as to construct their homes. In this area are large populations of clams, polychaete worms, isopods, amphipods, and other crustaceans (Brewer, 1 88, p. 3)~~Sandy and muddy shores are the primary habitat for large populations of clams, polychaete worms, isopods, amphipods, and other crustaceans (Brewer,
1 88, p. 3). The substrate is generally granular, ranging from sand-sized particles of 12
calcareo~~u~~ns (reworked reef) materials to finer grained silt, clays, and organic materials. The organisms burrow for their protection from predation as well as to construct their homes.

Coastal Zone

The coastal zone is defined as that area which typically extends from the high tide mark on the land to the gently sloping, relatively shallow edge of the continental shelf, the submerged part of the continents. This may differ from the way the term coastal zone is defined in the State of Hawaii s Coastal one Management Program (HRS chapter 2 A).

Although it makes up less than 1 percent of the ocean s area, the coastal zone contains percent of all marine species ~~and is the site of most large commercial marine fisheries~~. The sharp increase in water depth at the edge of the continental shelf separates the coastal zone from the offshore zone. (Miller, 1 , p.133)

The coastal zone includes several different ecosystems. These include coral reefs, estuaries, and coastal wetlands. There are no estuaries or coastal wetlands in the Ocean Area region of influence. However, there are coral reefs, particularly the fringing coral reefs found off the coasts of Kauai, Niihau, Kaula, and Tern Island, and the atoll reefs that make up Johnston Atoll. Coral reefs are the world s oldest and most diverse and productive ecosystems the marine equivalent of tropical rain forests (Miller, 1 , p.13). ~~Single-celled photosynthetic protists living in or between the cells of coral animals synthesize organic food compounds for the polyps.~~ The ~~polyps~~ coral animals secrete a skeleton made of calcium carbonate that solidifies into the structure of the coral reef. Algae and other producers give corals their bright colors. This coral reef structure provides plentiful food for fish, starfish, and other marine animals, as well as providing an excellent habitat and protection from predation. (Miller, 1 , p.13) Species diversity associated among reef communities is probably the highest of all biological habitats in the sea. Reefs support a wide variety of marine life including sponges, snails, clams,tunicates, cnidarians (hydraes, ellyfish, and sea anemones), bryozoans, sea squirts, sea slugs, worms, shrimp, crabs, lobster, and many fish. As coral reefs have such large diversities of organisms, the food webs are also some of the most complex in the animal world. (Waller, 1 , p.88). 18

Coral reef ecosystems grow slowly and are easily disrupted. They thrive only in clear, clean, warm, and shallow water of constant high salinity. (Miller, 1 , p.13) The highest salinity values tend to occur between the latitudes 2 and 3 degrees north and south of the equator where there is the least rain and highest evaporation rate (Waller, 1 , p.38). The 18
temperature range for coral reef development is between 18.1 to C (. to 1 F). However, for maximum reef development, a temperature range of 2 to 3 C (8 to 8 F) and a depth of to 2 m (1 . to . ft) is the most appropriate and productive zone. The average rate of coral growth is about mm (.2 in.) per year. On coral reefs, fish species assemblages are not stable. If the coral reef fish species are disturbed, they do not necessarily re-colonize in the same assemblage (Thorne-Miller Catena, 1 1, p. 2). 12

Offshore Zone

The next ocean zone is the offshore zone, which is at a depth between and 2 m (1 and ft) off the islands and atolls in the region of influence. The species of animals that occupy this zone seldom come near land but are not truly pelagic (Waller, 1 , p. 3). 18
Generally, this is a soft-bottom environment with insufficient light to support much photosynthesis, and consequentlythe benthic communities are dominated by animals with a low to moderate species diversity (Thorne-Miller Catena, 1 1, p.). In terms of the 12
offshore pelagic communities, these offshore coastal waters are characterized by less stable circulation patterns than deep-ocean waters and, consequently, the environment fluctuates more. They are characterized by strong current regimes and zones of periodic upwelling, where bottom waters rich in nutrients for plankton growth move to the surface to replenish waters carried offshore by wind-driven currents. As a result, these rich areas have a high productivity but a relatively low species diversity. The offshore, or coastal, pelagic food web includes phytoplankton, zooplankton, larvae, fish, marine mammals, seabirds, and bacteria (Thorne-Miller Catena, 1 1, p.). 12

3.1.1.3.2.3 Special Habitats

Hawaiian Islands Humpback Whale National Marine Sanctuary

The Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) was created by Congress in 1 2. Humpback whales (*Megaptera novaeangliae*) are endangered marine mammals and are therefore protected under provisions of the Endangered Species Act and the Marine Mammal Protection Act wherever they are found. Humpbacks are seen in the winter months in the shallow waters surrounding the Hawaiian Islands where they congregate to mate and calve. By agreement with the Governor of the

State of Hawaii in 1 , NOAA s Sanctuaries and Reserves Division modified the Congressional boundary of the HIHWNMS so that it includes certain designated areas generally within the 183-m (1 -fathom) isobath between the islands of Molokai, Lanai, and Maui. Portions of the shallow water along northern and southern Oahu, northern Kauai, and northwestern Hawaii (the Big Island) were added (see figure 3.1.1.3-2). The stated purposes of the sanctuary include: protection of humpback whales and their habitat within the sanctuary boundaries education and interpretation for the public as to the relationship of humpback whales to the Hawaiian Islands marine environment management of human uses within the sanctuary and identification of marine resources and ecosystems of national significance for possible inclusion in the sanctuary. (National Oceanic and Atmospheric Administration, 1 , p.1 through 2) Regulations implementing designation of the sanctuary specifically recognize that all existing military activities outlined or external to the sanctuary are authorized, as are new military activities following consultation with the NMFS. (2 FR 1 81 , 1 CFR 22.183)

Submerged Barrier Reef Offshore of PMRF

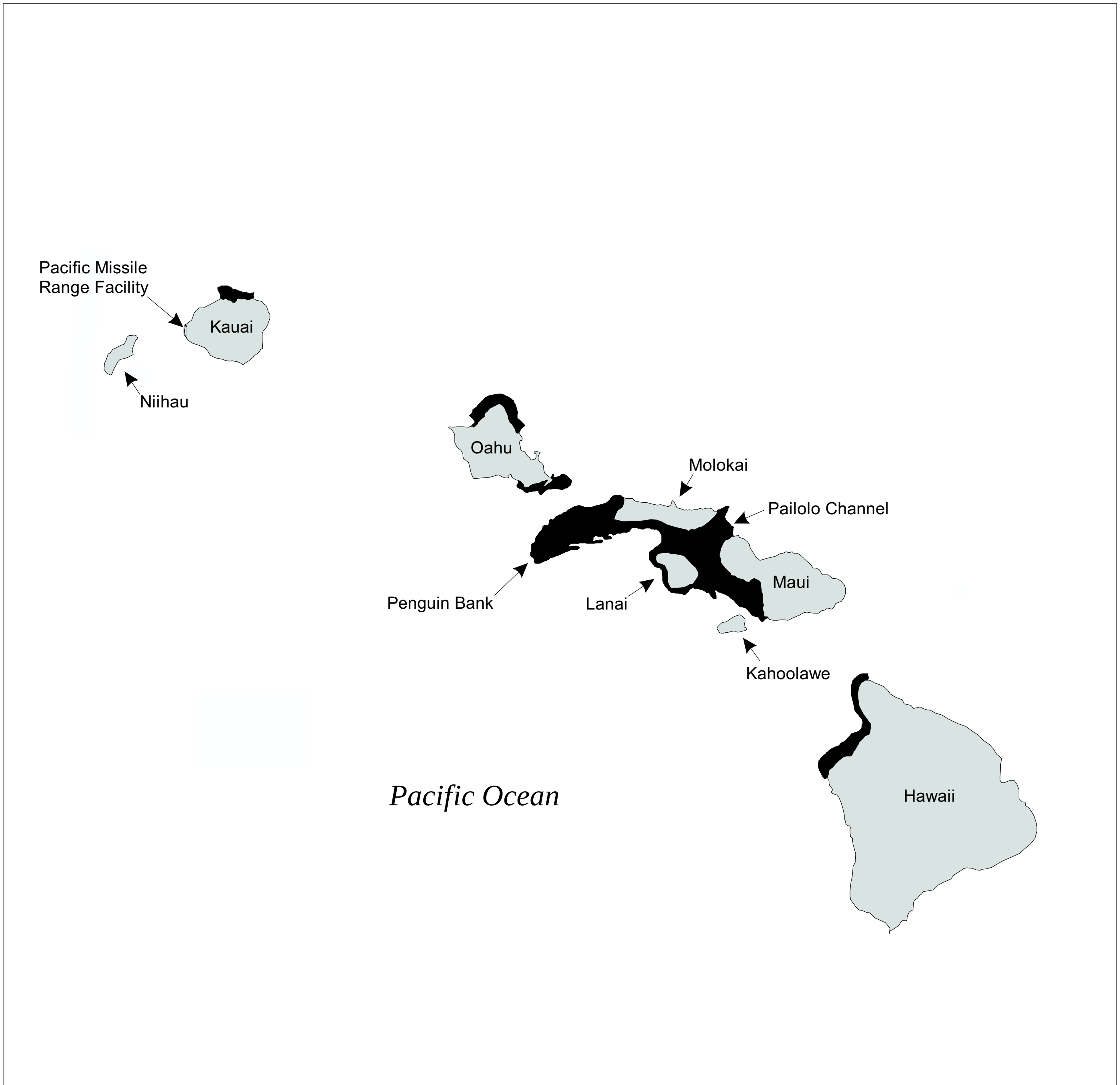
A submerged barrier reef that is roughly 12. km (8 mi) long and composed of fossil coral (*Porites compressa*) lies ~~ust~~ offshore of PMRF. The reef has a very irregular appearance resulting from numerous ledges, walls, slumped limestone blocks, and mounds. Coral density is low and is dominated by encrusting and mound-building *Porites lobata* and small stands of arborescent corals. Damselfishes (pomacentrids) and surgeonfishes (*Ctenochaetus strigosus*) ~~were~~ are common in areas composed of live foliaceous coral, whereas the bluestripe snapper (*Lutjanus kasmira*) and goatfishes (*Mulloides flavolineatus*, *Parupeneus multifasciatus*, and *Parupeneus cyclostomus*) ~~were~~ are associated with ad acent sandy, open-water habitats. (EDAW, 1 , 2 Nov, p.1) 22

The exercise area, landward of the barrier reef, appears to represent a former shallow-water lagoon that is now dominated by a flat to slightly undulating limestone bottom interspersed with deposits of unconsolidated bioclastic sand. Coral and fish diversity is low within the exercise area as a result of deep water, low coral density, and seasonal sand scouring. Fishes associated with the low vertical relief habitat include the bluestripe snapper (*Lutjanus kasmira*) and several species of burrowing blennies. Pelagic fishes associated with the exercise area include acks, amber ack (*Seriola dumerili*), and flying fishes. (EDAW, 1 , 2 Nov, p.1) 22

Protected species observed in the exercise area include bottlenose (*Tursiops truncatus*) and spinner dolphins (*Stenella longirostris*) and the threatened green sea turtle (*Chelonia mydas*). Hawaiian monk seals (*Monachus schauinslandi*) may occasionally occur in the exercise area. The endangered humpback whale (*Megaptera novaeangliae*) is a seasonal visitor, and they as well as other whale species may be expected to occur within the exercise area between the months of December and April. (EDAW, 1 , 2 Nov, p.1) 22

3.1.1.3.2.4 Candidate, Threatened, and Endangered Species

According to the Endangered Species Act, any species that is in danger of extinction throughout all or a significant portion of its range may be listed as an endangered species.



Source: Modified from National Marine Sanctuaries, 1 , 2 May. p. 1-3.

67

EXPLANATION

State of Hawaii s Areas for Inclusion in Sanctuary Boundary, 1 (defined as within the 1 fathom isobath)

Land Area

Hawaiian Islands Humpback Whale National Marine Sanctuary Boundary

Hawaiian Islands

Figure 3.1.1.3-2

NORTH

Scale

8 Kilometers

2 Miles

pmrf br 2

Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range may be listed as a threatened species. The State of Hawaii Department of Land and Natural Resources (DLNR) prepares its own list of threatened and endangered species, which includes federally listed species pursuant to HRS 1 -D. Ten terrestrial species potentially occur on and ad acent to PMRF/Main Base (table 3.1.1.3-1).

Table 3.1.1.3–1: Threatened and Endangered Terrestrial Species in the PMRF/Main Base Region of Influence

	Scientific Name	Common Name	Status	
			Federal	**State of Hawaii**
Plants				
	Panicum niihausense	Lau ehu	E	E
	Sesbania tomentosa	Ohai	E	E
Birds				
	Anas wyvilliana	Koloa-maoli (Hawaiian duck)	E	E
	Asio flammeus sandwicense	Pueo (Hawaiian short-eared owl)	N/A	E
	Fulica americana alai	Alae-ke oke o (American/ Hawaiian Coot)	E	E
	Gallinula chloropus sandvicensis	Alae- ula (Hawaiian Gallinule/common moorhen)	E	E
	Himantopus mexicanus knudseni	Ae o (Hawaiian black-necked stilt)	E	E
	Pterodroma phaeopygia sandwicense	Hawaiian dark-rumped petrel	E	E
	Puffinus auricularis newelli	A o (Newell s shearwater)	T	T
Mammal				
	Lasiurus cinereus semotus	Hawaiian hoary bat	E	E

Source: U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-13. 130
Legend:
E Endangered
N/A Not applicable
T Threatened

Flora

Two federally listed plant species have been observed north of PMRF/Main Base. Ohai (*Sesbania tomentosa*), a spreading shrub, is a federally endangered species that has been observed in the sand dunes to the north of the KTF launch complex and could potentially occur on PMRF/Main Base. It has been observed in Polihale State Park and might occur in or near the coastal area of PMRF/Main Base. (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-1) 13
However, this species was not observed during any of the floral surveys conducted within PMRF/Main Base in 1 . Lau ehu (*Panicum niihausense*), a rare grass, is a federally endangered species and has been observed near Queens Pond. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-12) 13

Fauna

Six species of birds that are listed as federally threatened or endangered are potentially present or confirmed in the PMRF/Main Base area. Kauai provides the last Hawaiian habitat for the federally threatened Newell s shearwater (*Puffinus auricularis newelli*). The Newell s shearwater nests from April to November in the interior mountains of Kauai. When nestlings are abandoned by the adults in October and November, they leave the nesting grounds at night and head for the open ocean. Flying near urban areas, they become temporarily blinded by lights and have a tendency to collide with trees, utility lines, buildings, and automobiles. The most critical period for these collisions is 1 week before and 1 week after the new moon in October and November.

The dark-rumped petrel (*Pterodrome phaeopygia sandwicense*), which is listed as federally endangered, may traverse the area from their nesting grounds to the sea. Fledging of the dark-rumped petrel occurs in October, slightly earlier than that of the Newell s shearwater.

The Hawaiian (American) coot (*Fulica americana alai*), Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*), Hawaiian common moorhen (*Gallinula chloropus sandvicensis*), and Hawaiian duck (*Anas wyvilliana*) are Federal and State endangered species that have been observed in the drainage ditches and ponds on PMRF/Main Base.

Alae-ke oke o *(Fulica americana alai)* (Hawaiian coot) is a Federal and State endangered subspecies of the American coot. It is limited to wetland habitats along agricultural drainage ditches and settling ponds (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-1 through
3-2). The alae-ke oke o is endemic to the Hawaiian Islands and is nonmigratory. 13

Ae o *(Himantopus mexicanus knudseni)* (Hawaiian black-necked stilt) is a Federal and State endangered subspecies of the North American black-necked stilt. Habitat for this bird includes ponds, drainage ditches, and pasture lands. The ae o is endemic to the Hawaiian Islands.

Alae- ula *(Gallinula chloropus sandvicensis)* (Hawaiian Gallinule) is a Federal and State endangered subspecies of the common North American moorhen. It is expected to occur in drains and ponds in the region since its habitat is limited to wetlands along agricultural drainage ditches and settling ponds (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-
1 through 3-2). The alae- ula is endemic to the Hawaiian Islands and is nonmigratory with a 13
range limited to Kauai and Oahu.

Koloa-maoli *(Anas wyvilliana)* (Hawaiian duck) is a Federal and State endangered species of duck which has been observed in the wetlands of PMRF and the ditches of Mana. Habitat for the koloa-maoli includes marshes, drainage ditches, and wet agricultural land. The koloa-maoli is endemic to the Hawaiian Islands, with the only remaining native population on the Island of Kauai.

Pueo *(Asio flammeus sandwicense)* (Hawaiian short-eared owl) is a State listed endangered species. This short-eared owl is the only endemic terrestrial bird species that occurs in the region.

The native Federal endangered Hawaiian hoary bat (*Lasiurus cinereus* spp. *Semotus*) has not been observed at PMRF/Main Base, although it is known to feed offshore and has been observed at the Polihale State Park north of PMRF/Main Base.

Marine Fauna

~~Nine~~ Eleven marine wildlife species that are listed as Federal and State threatened or endangered occur in the area (table 3.1.1.3-2).

Whales

Humpback Whales. The humpback whale ~~(*Megaptera novaeangliae*)~~ is an endangered species. Overall, it is the fourth most numerically depleted large cetacean worldwide. Mature humpbacks weigh upwards of 3 ,288 kg (8 , lb). On average, adult females grow to about 13. m (ft), while males are slightly smaller at 13.1 m (3 ft). The humpback s life span is normally about 3 to years. They are generally dark blue/gray on their back, but the flippers (over . m 1 ft in length), sides, and ventral surfaces of the body and flukes have substantial areas of white pigmentation and scars. Each fall, humpbacks migrate towards the equator to subtropical breeding grounds to calve, nurse, breed, or rest. In the spring, they return to the colder, higher latitude waters to feed on the highly abundant fish and krill stocks. The Hawaiian Islands provide wintering habitat for migrating humpback whales from Alaska and the Bering Sea. Approximately two-thirds of the North Pacific population (between 2, and 3,) winter in Hawaii. Although they are found throughout the Hawaiian Islands, the highest density occurs in waters less than 183 m (1 fathoms) deep around the four-island area (Maui, Molokai, Lanai, and Kahoolawe) the Penguin Bank area aroundNiihau and West Kauai and along the northwestern coast of the Big Island. Humpbacks are not known to extensively feed while in Hawaii, although opportunistic feeding has been observed. (National Oceanic and Atmospheric Administration, 1 , p.1-)

The humpback whale population in the Hawaiian Islands appears to be growing. One indication of population increase is the encounter rate, defined as the number of sightings per unit distance traveled during aerial surveys. During a 1 3 survey, 3 groups of whales were encountered while traveling a total of 1 , 2 km (8,11 nmi). The corresponding encounter rate was . 8 groups/nmi. In 1 , 2 ,822 km (11,2 3 nmi) were traveled during surveys, with 83 groups of humpback whales being sighted, an encounter rate of . groups/nmi. (Mobley and Grotefendt, 1) While the results of any survey are sub ect to variability 8
caused by sea state (roughness of the seas) and visibility, the evidence supports the conclusion that the humpback whale population in Hawaiian waters is growing.

Light is quickly absorbed in oceanic waters. As a whale dives deeper, the sea becomes dark and vision becomes more difficult. Sound, however, is not absorbed so quickly and is easily transmitted through water, traveling five times faster in water than air. Most marine mammals, and particularly humpback whales, have evolved to take advantage of this physical property and rely heavily upon sound for communication. Both male and female humpback whales produce an incredibly wide assortment of sounds, covering the widest frequency range of all baleen whales (2 to 8, hertz). Their highly complex vocalizations can be heard throughout the wintering areas. Vocalization consists of feeding calls and other social sounds during their feeding season in Alaska (Richardson, 1). 2

Table 3.1.1.3-2: Summary of Marine Mammals and Sea Turtle Species within the Hawaiian Coastal Area (Page 1 of 2)

Common Name of Marine Animal	Name of Species	Federal (State) Status	Range Species Occur	Time Period Within Range	Potential Population in Range Vicinity	Number in Pods	Mating/ Calving Period	Bottom Feeding Habits
Minke Whale	*Balaenoptera acutorostrata*	NL	1,2,3	ear Round mostly Summer/Fall	P	1 - 2	February/ August	No
Sei Whale	*Balaenoptera borealis*	E (E)	1,2,3	Fall Winter	P	2 -	October/ March	No
Blue Whale	*Balaenoptera musculus*	E (E)	1,2,3	ear Round	P	1 - 2	Winter/ Winter	No
Fin Whale	*Balaenoptera physolus*	E (E)	1,2,3	ear Round	P	3 -	November/ February	No
Humpback Whale	*Megaptera novaeangliae*	E (E)	1,2,3	December to April	P	1 - 8	Winter/ Winter	No
Bryde s Whale	*Balaenoptera edeni*	NL	1,2,3	ear Round, only in _ 8°F (2 °C) Water	P	-	ear Round/ ear Round	No
Pygmy Killer Whale	*Feresa attenuata*	NL	1,2,3	ear Round	P	1 -	U/Spring	No
Short Finned Pilot Whale	*Globicephala macrorhynchus*	NL	1,2,3	ear Round, mostly in 1 m (328.1 ft) Deep Water	P	1 - 2	ear Round/ ear Round	No
Pygmy Sperm Whale	*Kogia breviceps*	NL	1,2,3	ear Round	P	3 -	Summer/ Spring	es
Dwarf Sperm Whale	*Kogia simus*	NL	1,2,3	ear Round	P	3 -	Summer/ Spring	No
Arch Beaked Whale	*Mesoplodon carlhubbsi*	NL	1,2,3	ear Round	P	U	U/U	es
Blainville s Beaked Whale	*Mesoplodon dersirostris*	NL	1,2,3	ear Round Along Edge of Continental Shelf or Continental Slope	P	3 - 1	ear Round/ ear Round	es
Japanese Beaked Whale	*Mesoplodon ginkgodens*	NL	1,2,3	ear Round	P	U	U/U	es
Killer Whale	*Orinus orca*	NL	1,2,3	ear Round	P	- 2	ear Round/ ear Round	No
Melon-Headed Whale	*Peponocephala electra*	NL	1,2,3	ear Round	P	2 - - 1 consistently	ear Round/ ear Round	Possible
Sperm Whale	*Physeter macrocephalus*	E (E)	1,2,3	ear Round	P	1 - 1	April/August	No
False Killer Whale	*Pseudorca crassidens*	NL	1,2,3	ear Round		-	ear Round/ ear Round	No
Cuvier s Beaked Whale	*Ziphius carvirastris*	NL	1,2,3	ear Round Cosmopolitan	P	1 - 1	ear Round/ ear Round	es
Short-Beaked Common Dolphin	*Delphinrus delphis*	NL	1,2,3	ear Round mostly Winter/Spring	P	1 - 2,	Summer/ Summer	es

Table 3.1.1.3-2: Summary of Marine Mammals and Sea Turtle Species within the Hawaiian Coastal Area (Page 2 of 2)

Common Name of Marine Animal	Name of Species	Federal (State) Status	Range Species Occur	Time Period Within Range	Potential Populatio n in Range Vicinity	Number in Pods	Mating/ Calving Period	Bottom Feeding Habits
Risso s Dolphin	*Grampus griseus*	NL	1,2,3	ear Round in Deep Warm Water 1 ° 2 ° C (F)	P	3- 3	U/Winter	No
Fraser s Dolphin	*Lagenodelphis hosei*	NL	1	ear Round mostly in m (2, 3 ft) Deep Water	P	up to	U/U	Possible
Northern Right Whale Dolphin	*Lissodelphis borealis*	NL	1,2,3	ear Round mostly Winter/Spring	P	U	U/U	es
Pantropical Spotted Dolphin	*Stenella attenuata*	NL	1,2,3	ear Round mostly in 1 1, m (328.1 3,281 ft) Water	P	3 - 1,381	ear Round/ ear Round	No
Spinner Dolphin	*Stenella logirostris*	NL	1,2,3	ear Round		1 - 3	ear Round/ ear Round	No
Rough-Toothed Dolphin	*Steno bredanensis*	NL	1,2,3	ear Round mostly in 1 1, m (328.1 3,281 ft) Water	P	3 - and up to	U/mid-Summer	No
Bottlenose Dolphin	*Tursiops truncatus*	NL	1,2,3	ear Round	P	1 - 1,	Spring-Summer/ Spring-Summer	es
Northern Elephant Seal	*Mirounga angustirostris*	NL	2,3	ear Round	Rarely	1 - 2	December/ March	Possible
Hawaiian Monk Seal	*Monochus schauinslandi*	E (E)	3	ear Round Nonmigratory	1,	U	June-July/ April-May	es
Loggerhead Sea Turtle	*Caretta caretta*	T NL	1,2,3	ear Round, only in Water _ 22.2° C (1 2°F), Visitor	Rarely	1	Late Winter/ Early Spring	es
Green Sea Turtle	*Chelonia mydas*	T (E)	1,2,3	ear Round only in Water _ 3 °C (8 °F)	2,	1	Early Spring/ Fall	es
Leatherback Sea Turtle	*Dermochelys coriacea*	E (NL)		ear Round	P	U	Winter/Summer	es
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E (E)	1,2,3	ear Round	P	1	Early Spring/ Fall	es
Olive Ridley Sea Turtle	*Lepidochelys olivacea*	T (NL)		ear Round	P	U	Spring/Fall	es

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Source: Mobley, 1 , Dec.

E - Endangered
T - Threatened
NL - Not Listed
U - Unknown
P - indicates that the species is present within the region but no information is available to estimate the population.

Range
1 - HATS
2 - BSURE
3 - BARSTUR

The migratory humpback whale ~~(*Megaptera novaeangliae*)~~, Federal and State endangered, was observed breaching off the coast of PMRF/Main Base during field surveys in 1 . These and other whales are known to use the channel between Kauai and Niihau. ~~The~~

~~North Pacific Hawaiian humpback whale stock is estimated to be between 2, to 3, individuals.~~ (U.S. Army Program Executive Office, 1 , May, p.3- through 3- , 3- through 3-8) 12

Other endangered whales found in the waters off the Hawaiian islands include the sei, blue, fin, and sperm whales~~.~~ (table 3.1.1.3-2).

Sei Whale. The sei whale, also called Rudolphi s Rorqual (*Balaenoptera borealis*), is a swift baleen whale of the family Balaenopteridae. Usually about 13 to 1 m (to ft) long, the sei inhabits the Pacific from the Arctic to the Antarctic, migrating between cold and temperate summer waters and winter breeding grounds in warmer regions. It is found in Hawaiian coastal waters in the Fall and Winter.

Blue Whale. The blue whale (*Balaenoptera musculus*), the largest of all known animals, attains a maximum length and weight of about 3 m (1 ft) and 1 tonnes (1 tons). It is found alone or in small groups throughout the Pacific Ocean, spending the summer in polar waters and moving toward the equator to breed in the winter. It is found in Hawaiian coastal waters year round.

Fin Whale. The fin whale, also called the finback or razorback whale (*Balaenoptera physalus*), is a slender-bodied baleen whale 18 to 2 m (to 8 ft) long. It is found in all of the world s oceans in groups of a few to several hundred. It lives in polar waters in summer and moves to warmer waters in winter to breed, and is found in Hawaiian waters year round.

Sperm Whale. The sperm whale (*Physeter macrocephalus*) is a thickset animal distinguished by its enormous head, squarish in profile, and a narrow, underslung lower aw equipped with large, conical teeth. The male attains a maximum length of about 1 m (2 ft). It is found in temperate and tropical waters throughout the world, usually in herds of about 1 to 2 individuals. It is found in Hawaiian coastal waters year round. The sperm whales were originally hunted for blubber and spermaceti oil and may be increasing in numbers near Hawaii since receiving protection.

Seals

Hawaiian Monk Seals. The Hawaiian monk seal ~~(*Monachus schauinslandi*),~~ is the most endangered seal in U.S. waters. After the northern right whale, it is also the nation s most endangered marine mammal. Females average 2. m (. ft) in length, with males smaller. The monk seals are gray to brownish above, paler below. Pups have a woolly black coat (Waller, 1 , p.28). 18

Hawaiian monk seals occur only in the Hawaiian archipelago where pupping habitat is limited almost exclusively to the chain of small, mostly uninhabited islands and atolls extending some 1, 31 km (1,2 mi) northwest of the main Hawaiian islands. More than percent of the Hawaiian monk seal population, estimated at 1,2 to 1, animals, is centered at five ma or breeding islands and atolls French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, and Kure Atoll (National Oceanic and Atmospheric Administration, 1 , p.1). The seals require undisturbed sandy beaches to haul out to rest, give birth, and nurse their young. They occur occasionally in the waters off Kauai,

and have been known to haul out on the beaches of west Kauai (Pacific Missile Range Facility, Commander, 1 , Apr, p.3-), and on Niihau. French Frigate Shoals, including Tern 83
Island, is the species largest breeding colony (National Oceanic and Atmospheric Administration, 1 , p.1).

The Hawaiian monk seal, ~~(*Monachus schauinslandi*),~~ a Federal and State endangered species, is an indigenous mammal and has been observed at PMRF/Main Base. No seal pupping has been observed on PMRF beaches. Two or three seals are regularly seen around the Island of Kauai but are considered stragglers. While pupping may occur on Kauai, no pupping has been observed on the beaches of PMRF.

Sea Turtles

Green Sea Turtle. The green sea turtle ~~(*Chelonia mydas*)~~ is found throughout the Pacific between 3 degrees north and south. Adult turtles may measure up to 12 m (ft) long (Waller, 1 , p.222) and weigh approximately 1 kg (331lb). Its color is olive brown to 18
black on the upperside, pale yellow on the underside. In Hawaii, approximately 8 percent of all green sea turtles are hatched in the sands of East Island, French Frigate Shoals in the Northwest Hawaiian Islands. The hatchlings emerge after an approximately -day incubation period. They generally emerge at night and begin crawling down to the ocean immediately. Once they reach the sea they lead a pelagic existence for 3 years. The 3-year-old pelagic uveniles then come onto shore, mainly in the leeward islands and begin feeding on benthic algae for the next 2 years or so. When they reach sexual maturity, at about the age of 2 , they migrate to French Frigate Shoals where mating and nesting occur. After they lay their eggs, both the females and males migrate back to their foraging areas (National Oceanic and Atmospheric Administration, 1 , p.1).

During a 1 survey of the shoreline of PMRF/Main Base, approximately 32 green sea turtles ~~(*Chelonia mydas*)~~, a Federal threatened and State endangered species, were observed. One turtle nest was discovered on the southern portion of PMRF/Main Base in 1 8 , but no other use has been documented.

Other endangered or threatened sea turtles found in the waters off the Hawaiian Islands include the loggerhead, hawksbill, leatherback, and oliveridley sea turtles.

Loggerhead Sea Turtle. The loggerhead sea turtle (*Caretta caretta*) is a large turtle similar to the green turtle but with a relatively larger head. It attains a shell length of about . to 2.1 m (2.3 to . ft), usually weighing about 13 kg (2 lb). Found in oceans throughout the world, it is a visitor to the Hawaiian coastal waters. ~~The hawksbill (*Eretmochelys imbricata*) is a relatively small sea turtle found in warm waters throughout the world. It usually attains a shell length of about to cm (1 to 22 in) and a weight of about 13 to kg (2 to 1 lb). It is found in Hawaiian coastal waters year round, but no information is available to estimate its population.~~

Hawksbill Sea Turtle. The Hawksbill sea turtle (*Eretmochelys imbricata*) is a medium-sized turtle, up to cm (3 . in.) long, and is usually found in tropical waters over 22 C (1. F), often on coral reefs. The upper side is often a rich flecked tortoiseshell-brown (Waller, 1 , p.222). It is known infrequently in the waters off the Hawaiian Islands (Pacific Missile Range 18
Facility, Barking Sands, Hawaii, 1 , Apr, p.3-). Hawksbill sea 8

turtles occur in Hawaiian coastal waters year round. The species is a solitary nester, which makes population estimates difficult. They are known to nest on the main islands, primarily on several small sand beaches on the islands of Hawaii and Molokai. Two of the sites are at a remote location in the Hawaiian Volcanoes National Park. (U.S. Fish and Wildlife Service Division of Endangered Species, Internet Web Page, 1 8, Apr) 2 2

Leatherback Sea Turtle. The leatherback sea turtle (*Dermochelys coriacea*) is the largest living turtle, ge~~r~~nerally attaining a ~~total~~ length of 2.1 m (ft), with a weight of around kg (1,2 lb), although ~~much larger~~greater lengths and weights have been reported. The leatherback has no hard shell. It is a strong swimmer and inhabits open seas throughout the world. It is omnivorous and takes both animal and plant material. It is found in Hawaiian coastal waters year round, but does not nest in the Hawaiian Islands and no information is available to estimate its population.

Olive Ridley Sea Turtle. The olive (Pacific) ridley (*Lepidochelys olivacea*) is a small, hard-shelled marine turtle, with a carapace length from to 8 cm (22 to 3 in.). The range of the olive ridley is essentially tropical. In the eastern Pacific, nesting takes place from southern Sonora, Mexico, south at least to Colombia. Non-nesting individuals occasionally are found in waters of the southwestern United States. The olive ridley does not nest within the State of Hawaii. It has been recorded occasionally from Galapagos waters, but is essentially very rare throughout the islands of the Pacific. The overall distribution of the olive ridley has parallels with that of the leatherback sea turtle. (National Marine Fisheries Service, Office of Protected Resources, Internet Web Page, 1 8, Apr U.S. Fish and Wildlife Service, Endangered Species Internet Web Page, 1 8, Apr) 2 1

Other Marine Mammals

A variety of other whales and dolphins are found around the Hawaiian Islands (table 3.1.1.3-2). Other baleen or mysticete whales include the Minke whale (*Balaenoptera acutorostrata*) and Bryde s whale (*Balaenoptera edeni*). These whales have been identified both by visual sighting and by acoustic surveys. More than 2 species of toothed whales and dolphins are known to exist around the islands, including those most frequently seen: the spinner dolphin ~~(*Stenella longirostris*),~~ the spotted dolphin (*Stenella attenuata*), the bottlenose dolphin ~~(*Tursiops truncatus*)~~ the short finned pilot whale (*Globicephala macrorynchus*), the false killer whale (*Pseudorca crassidens*), and the sperm whale (*Physeter ~~catadon~~catodon*). The spinner dolphin is commonly seen on the leeward side of all of the main Hawaiian Islands and is known for its graceful spinning displays as it umps out of the water. Spotted dolphins are usually located near the spinners in deeper waters, while the bottlenosed dolphins frequent both shallow and deep areas. Groups of pilot and false killer whales are frequently seen by fishermen and are generally found in groups or pods.

Although some whales like the humpbacks seasonally migrate to Hawaii, no overall count of whales and dolphins is available. Table 3.1.1.3~~-~~2 provides a summary of marine mammals and sea turtle species known to be found within the coastal area generally, but no systematic data about number of animals and how they might change by seasons (except for the humpback whale) are available.

The Navy has been involved in various studies on sea turtles and marine mammals. The marine mammal studies have included pinnipeds, dolphins, and both baleen and toothed whales. The broad areas of research range from acoustic ecology and measures of auditory functions to effects of low frequency sounds on behavior, movements, hearing, and physiology.

3.1.1.4 Cultural Resources— PMRF/Main Base

For the purposes of contextual identification, cultural resources are divided into three categories: archaeological (prehistoric resources), historic resources, and traditional (e.g., ethnically traditional resource use areas). For the purposes of this EIS, cultural resources are also defined to include paleontological resources which can be considered for National Natural Landmark designation as stipulated in 3 CFR 2. (b).

The Navy has recently finalized a Cultural Resources Management Overview Survey of PMRF for the purpose of establishing an inventory of cultural resource properties at this installation (U.S. Department of the Navy, 1 , Aug, p.1 through). This document will serve as the 1
basis for development of an Integrated Cultural Resources Management Plan (ICRMP) for the long-term management of historic resources at PMRF (Inouye, 1 8, 28 Jan).

PMRF s Cultural Resources Management Overview Survey report of existing archaeological sites, historical records, and maps indicated that there are numerous recorded and unrecorded archaeological sites within PMRF and the surrounding area, some with subsurface components. (U.S. Department of the Navy, 1 , Aug, p.31 through 2) 1

Since the preparation of the Cultural Resources Management Overview Survey, PMRF has conducted a Phase I archaeological survey of the installation s previously unsurveyed areas. In addition, a historic resources survey (which includes PMRF s Cold War properties) was conducted (U.S. Department of the Navy, 1 , Aug, p.i, p.). ~~An ICRMP for PMRF is~~ 1
~~currently being developed (Inouye, 1 8, 28 Jan).~~ Previous archaeological inventory surveys of PMRF and its immediate vicinity include surveys conducted by Thrum (1), Bennett (1 31), Kikuchi (1 and 1 8), Ching (1), Cleland (1), Bordner (1), Sinoto (1 8), Kennedy/Jenks Engineers (1 82), ent (1 82 and 1 1), McMahon (1 88), Douglas (1), Gonzalez et al. (1), Walker and Rosendahl (1), Welch (1), Flores and Kaohi (1 2), O hare and Rosendahl (1 3), the U.S. Navy (undated map), and the State of Hawaii Division of State Parks (1 3 and 1) (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1). 13

3.1.1.4.1 Region of Influence

The region of influence for cultural resources includes the property of PMRF/Main Base and the offshore areas (see figure 3.1-1). For the purpose of consistency in the EIS, the Area of Potential Effect for cultural resources will be the same as the region of influence for cultural resources. The Area of Potential Effect for cultural resources is defined as the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if such properties exist (3 CFR 8 .2c). It is within the area(s) of potential effects of a particular undertaking that an agency is responsible for identifying historic properties under Section 1 (3 CFR 8 . a.1).

3.1.1.4.2 Affected Environment

~~Since the preparation of the Cultural Resources Management Overview Survey report for PMRF, the Navy has conducted a Phase I archaeological survey of the installations unsurveyed areas, a historic resources survey which includes the facilities Cold War properties, and has prepared a cultural resources management plan (U.S. Department of the Navy, 1 , Aug, p.i). Finalization of an ICRMP is expected by the middle of 1 8 (Inouye, 1 8, 28 Jan).~~

Literature and archival documents reviewed included accounts of early mariners and other foreign arrivals in Hawaii Native Hawaiian historical accounts various histories ethnographers, historical and archaeological reports and manuscripts atlases, soil surveys, historical maps, Land Commission Awards (LCAs), Grants, Leases, and other real property documents and U.S. Navy Master Plans and other related documents (U.S. Department of the Navy, 1 , Aug, p. through). 1

A summary of known archaeological resources at PMRF compiled in the resources management overview survey of PMRF has identified 1 archaeological resources, 3 historic resources, and one Native American Graves Protection and Repatriation (NAGPRA) reinterment area. The 1 archaeological resources include 1 sites registered with Hawaii State Inventory of Historic Places (SIHP), four previously reported archaeologically sensitive areas that are not currently registered with the SIHP, and one previously unidentified archaeologically sensitive area (U.S. Department of the Navy, 1 , Aug, p.i). Sites were 1
evaluated for National Register of Historic Places (National Register) significance and assigned the applicable National Register Treatment Category as defined in the *Navy's Guidance for Preparation of Historic and Archaeology Resources Protection Plans at U.S. Navy Installations* (U.S. Department of the Navy, 1 , Aug, p.1,). 1

The Guidelines provide three Treatment Categories for cultural resources:

- Category I Resources of outstanding historical, architectural, archaeological, engineering, or cultural significance. Further, these resources have been evaluated as having retained their integrity i.e. original and/or authentic Period materials, design and context.

- Category II Resources of lesser historical, architectural, archaeological, engineering cultural significance than resources included in Category I. They may not be able to match Category I properties in terms of integrity.

- Category III Resources that qualified professionals have concluded do not meet National Register eligibility, as well as all World War II temporary buildings, and buildings in historic districts that have been professionally evaluated as non-contributing elements of the district. (U.S. Department of the Navy, 1 , Aug, p.). 1

The Treatment Categories above are based on the 1 Historic and Archaeological Resources Production (HARP) Plan Guidelines provided in the 1 Cultural Resources Management Overview Survey report for PMRF (U.S. Department of the Navy, 1 , Aug, 1

p. 3-). This EIS reflects the Treatment Categories as assigned to that survey document prior to issuance of the Navy s January, 1 , HARP Planning guidelines.

The cultural resources management overview survey for PMRF also sought to identify buildings, structures, ob ects, sites, and/or districts that are potentially eligible for the National Register. Factors considered in evaluating potential historic resources (i.e. structures) included historic information such as their original construction date, the historic role of the structure in the operation of the base, and its role during World War II and the post-war period. Architectural factors were also considered, including the quality or uniqueness of the design and its ability to serve as an example of a style with historical importance, and the amount and nature of alterations to the building, structure, or ob ect and the permanency of these alterations. The resources were then grouped into National Register Resource Treatment Categories according to their significance and condition (U.S. Department of the Navy, 1 , Aug, p.). 1

This aspect of the survey was limited to historic resources constructed from the establishment of the base by the military up to and including the year 1 . These buildings, structures, ob ects, or districts would be at least years old in the year 2 , and, therefore, potentially eligible for the National Register at that time (U.S. Department of the Navy, 1 , Aug, p.). 1

3.1.1.4.2.1 Archaeological Resources (Prehistoric and Historic)

The physiography and climate of Kauai have supported a cultural resources chronology that extends into the past for nearly 2, years. Oldest in the archipelago and distinct from the other islands of Hawaii, cultural materials recovered from Kauai infer a prehistoric connection with much older cultures from the southern islands of central Polynesia (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1 through 3-1). 13

The PMRF/Main Base is located within an archaeologically and ethnographically sensitive region of Kauai known as Mana. This area has been identified in traditional Hawaiian religious cosmology as *leina-a-ka-‘uhane*. This term refers to the cliffs or seacoast promontories from which the spirits of the dead would ~~to~~ enter the spiritual realm. The Nohili Dune area on the northern portion of PMRF/Main Base has been specifically cited in recorded Hawaiian oral literature as a burial area. Traditional Hawaiian mortuary practices indicate that human burials may be present in all sandy, coastal beach areas such as those at PMRF (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-2 through 3-28). Throughout prehistory, large areas of the 13
Mana Plain were covered by the great Mana swamp, and large inland lakes that allowed natives from the village of Mana to canoe as far south as Waimea. It is believed that these wet conditions encouraged the independent invention of aquaculture on Kauai and the construction of stone and earthen ponds for the growing of staples such as taro, yam, and sweet potatoes. After the arrival of Europeans to the island, aquaculture transitioned to agriculture through the eventual draining of the swamp and the cultivation of sugar cane and rice. The first successful sugar plantation to export from the islands was established at Koloa in 183 , and by the 1 3 s, nearly all of the Mana swamp had been filled to produce this crop (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1). 13

Nineteen archaeological sites were identified in PMRF s management overview survey. Within PMRF the following archaeological resources have been identified (table 3.1.1. -1) as follows:

- Fourteen SIHP designated archaeological resources (-3 - 1- , - 8, - , - 2 , - 3 - -82 , -82 , -182 through -183 , and -3 - -188 , and -188)
- Four archaeologically sensitive areas that have been briefly documented but do not have SIHP designations. These areas are: within the KTF the coastal zone ad acent to the south end of the airstrip the coastal zone in line with the north end of the airstrip and the entire coastal zone between Nohili Point and Nohili Ditch
- One NAGPRA reinterment of human remains (Site -3 -Ka-R)

Table 3.1.1.4-1: Known Archaeological Sites in the PMRF Installation

Site	Qualifying Characteristics	NR Treatment Category
-3 - 1-	Burial features and camp sites	II
-3 - 1- 8	*Elekuna Heiau*	II
-3 - 1-	House sites	II
-3 - -82	Reported coffin burials	II
-3 - -82	Habitation deposits	II
-3 - -182	Habitation deposits	I
-3 - -183	Habitation deposits	I
-3 - -1831	Reported bone remains	II
-3 - -1832	Reported bone remains	II
-3 - -1833	Reported bone remains	II
-3 - -183	Reported burial features	II
-3 - -188	Burial site	I
-3 - -188	Burial and midden scatter	II
-3 - 1- 2	Habitation deposits and midden scatter	II
-3 -Ka-R	Human cranium	Re-interred as provided by NAGPRA
-Ka-C -	Burial disinterred, others destroyed	II
Southern Portion of Airstrip (no number assigned)	Reported habitation deposits	II
KTF area (no number assigned)	Unidentified skeletal remains, habitation deposits	II
Nohili Beach (-Ka-C -)	Habitation deposits	II

Three of the fourteen SIHP designated archaeological sites (-3 - 1- , - 8, and -) have not been relocated since originally reported in 1 31. It has not been determined whether these sites have been destroyed or if subsurface remnants of these sites are still extant. Nine SIHP sites (-3 - ~~-~~ 1- to - , -3 - -82 , ~~-3 -~~ -182 , ~~and -~~183 , ~~-3 -~~ -188 , ~~and~~ -188 , ~~-3 -~~ and- 2) are known to contain habitation deposits, burial features, or both. All sites appear to contain Pre-Contact Period components with the exception of site -3 - -82 , which is reported to contain Post-Contact Period coffin burials. Five SIHP sites (-3 - -82 , -3 - -1831 to 183) do not provide sufficient documentation to evaluate the types of deposits or features present. Site -3 - - 1 is a Japanese Cemetery. Undocumented traditional Hawaiian agricultural features (rock alignments and possible water diversions) were also observed in the Kamokala Magazine area. No cultural resources were observed at Makaha Ridge, Kokee, or at the Port Allen facilities (U.S. Department of the Navy, 1 , Aug, p. 3). 1

Three of the nineteen archaeological resources identified in the management overview survey are designated under National Register Resources Treatment Category I (SIHP Sites -3 - -182 , -183 , and -188). Fifteen archaeological resources are designated under National Register Resources Treatment Category II (SIHP Sites -3 - 1- , - 8, - ,- 2 , -3 - -82 , -82 , -1831, -1832, -1833, -183 , -188 , -Bishop Museum Site -Ka-C , the central and southern coastal portion of the airstrip, the DOE KTF area, and Nohili Beach). Archaeological sites registered with the Hawaii SIHP at PMRF contain cultural features and deposits identified since the 1 3 s. In most cases, there is scant information regarding their size, depth and/or content and context. All of the archaeological resources identified at PMRF/Main Base are significant for their informational value (U.S. Department of the Navy, 1 , Aug, p.i). 1

Except for the historic cemeteries, all archaeological resources at PMRF/Main Base are located within the shoreline dune system that forms the installation s western border. Currently documented sites extend from Barking Sands in the northern portion of the facility to Waiokapua Bay in the south, indicating that the dune zone was used in the pre-contact period for burial interment and for seasonal habitation. Based on evidence provided by the number of burials along PMRF/Main Base s coastline, the dune zone at the facility can be delineated as an archaeologically sensitive zone with the potential to contain significant cultural resources throughout its north to south extension on the base. Inland from the dune area, archaeological evidence indicates the presence of distinct cultural resources. The two historic cemetery sites previously noted are situated in this interior area. The potential exists for the presence of other similar small, unmarked plantation period cemeteries in the interior area of PMRF/Main Base. The two zones which constitute the coastal portion of the installations property contain distinct cultural resources and both zones should be considered as archaeologically sensitive areas (U.S. Department of the Navy, 1 , p. 3). 1

3.1.1.4.2.2 Historic Buildings and Structures

Military use of the area known as PMRF began in 1 when the U.S. Army acquired a pre-existing grass airstrip. Named Mana Airport, the airfield was used extensively throughout World War II, changing names a number of times before being renamed Bonham AFB in 1 . In 1 , the U.S. Navy entered into oint-use agreement for the use of Bonham AFB, ha (1, ac) of which were transferred to permanent Navy status in 1 . Two years later, the Navy land was transferred (within the Navy) to the Commander, Pacific Missile Test Center and was renamed ~~the~~ PMRF (U.S. Army Program Executive Office, 1 , May, p .G-2). 12

The current mission of ~~the~~ PMRF is as a multi-environment test range providing realistic testing environments for antisubmarine, air, and surface weapons systems. The KTF portion of~~the~~ PMRF/Main Base was constructed in 1   2. The KTF originally supported the high-altitude nuclear testing program however, it now supports DOE research and development activities, including the launching of sounding rockets and rockets carrying experimental non-nuclear payloads (U.S. Army Program Executive Office, 1   , May, p.G-2). 12

Thirty-nine historic period resources were identified at PMRF thirty-five of these are associated with World War II base construction (see table 3.1.1. -2). Four resources date from the late nineteenth or early twentieth centuries. ~~t~~These include the Kawaiele Drain, a Japanese cemetery, another set of unmarked historic burials, and the Waterfront Operations Building used by PMRF at Port Allen. This building dates to 1 31 and is owned by the State of Hawaii and leased by PMRF (U.S. Department of the Navy, 1   , Aug, p. 8). These   and another 1   World War II structures are potentially eligible~~to~~ for the National Register. Nineteen other World War II structures are not considered eligible for~~to~~ the National Register due to their loss of integrity. While some commonplace infrastructure items and paved areas within PMRF are known to date to World War II, these facilities appear to have been replaced or paved over and can no longer be considered as historic resources (U.S. Department of the Navy, 1   , Aug, p.   ). 1

Thirty-seven of the thirty-nine historic resources are designated under National Register Resources Treatment Category II. Two historic resources designated as National Register Treatment Category III are composed of the demolished Public Works shop and common fuel storage structures   1 - 12 and   1 - 2   (U.S. Department of the Navy, 1   , Aug,p.i). 1

Four historic buildings representing a distinct type of underground structure are considered eligible for nomination to the National Register. These include the Armory, Telephone Exchange Building, Operational Storage Building, and Small Arms Magazines (U.S. Department of the Navy, 1   , Aug, p.i). 1

All wood-frame buildings on the base dating from 1   3 have been considerably altered, thus compromising their integrity and making them ineligible for listing in the National Register. These include the Public Works Maintenance Shop, Administration Office buildings, Sewage Pump Station Shop, Officers Club and VIP Cottages, and the Aircraft Ground Support Shop (U.S. Department of the Navy, 1   , Aug, p.   ). 1

~~This aspect of the~~ The Navy s survey was limited to historic resources constructed from the establishment of the base by the military up to and including the year 1   . These buildings, structures, ob ects, or districts would be at least   years old in the year 2   , and, therefore, potentially eligible to the National Register at that time (U.S. Department of the Navy, 1   , Aug, p.). An exception to the   -year eligibility criteria for listing consideration in the National Register would apply only if any of these buildings, structures, ob ects, or districts were deemed to be of exceptional importance (U.S. Department of Interior, National Park Service, Interagency Division, 1   1, p.2). 1

Table 3.1.1.4-2: Architectural and Historic Resources at PMRF Facilities

Site	Common Name	Date	Qualifying Characteristics	Treatment Category
1-	High explosive magazines	1 3	Associated with WW II base construction	II
	Fuse and detonator magazine	1 3	Associated with WW II base construction	II
	Small arms/pyro magazine	1 3	Associated with WW II base construction	II
-1	Missile magazines	1 3	Associated with WW II base construction	II
1 - 12, 1 - 2	Underground aircraft, truck and aircraft refueling structures	1 2	Common Fuel Storage not eligible	III
2 1	Public works shop	1 3	Demolished	III
281	Administration office building	1 3	Extensively altered	II
2	Administration office building	1 3	Extensively altered	II
2	Sewage pump station shop	1 3	Extensively altered	II
11 1	Officer s club and VIP cottage	1 3	Extensively altered	II
3	Aircraft ground support shop	1 3	Extensively altered	II
2	Open storage area	1 2	Extensively altered, Deteriorated	II
2	Crash fire mock-up structure	1 2	Associated with WW II base construction	II
38	Waterfront Operations Building (Port Allen)	1 31	Associated with early development of waterfront facilities on Kauai	II
3	Armory	1 2	Associated with WW II base construction distinctive construction type	II
28 , 3, 3 2	Telephone exchange building operational storage building small arms magazine	1 3	Associated with WW II base construction distinctive construction type	II
	Shore bunker	c.1 2	Example of WW II beach bunker in Hawaii	II
-8 - - 1	Japanese cemetery	early 2 th century	Associated with sugar plantation history of western Kauai	I
	Kawaiele Drain	18 8	Associated with the establishment of the first sugar plantation on western Kauai	III
-3 - -82	Burials/Cemetery	18 - 1 s	Historic/Burials	II

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Source: U.S. Department of the Navy, 1 , Aug., p. 1.

3.1.1.4.2.3 Traditional Resources

Within the region of influence, all of the traditional cultural materials identified to date have been associated with native Hawaiians however, a Japanese cemetery and other historical burials are located within the boundary of PMRF/Main Base. The Nohili Dune has been determined to be a site eligible for the National Register as a traditional cultural property. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1) 13

The ICRMP currently being developed for PMRF will provide, as appropriate, a summary of known cultural resources information and a list and brief description of properties listed or eligible for listing in the National Register. It will identify unique cultural resource issues confronting the installation as well as provide for preservation and mitigation strategies for threatened cultural resources. Procedures for dealing with unanticipated discovery of historic properties or other cultural resources will be included. The ICRMP also includes provisions for a coordination process between the installation, regulatory agencies, and the public that help ensure proper management of the installation s cultural resources (DOD Instruction 1 .3 *Environmental Conservation Program,* dated 3 May 1 , ~~1 , 3 May,~~ p. -3).

3.1.1.4.2.4 Existing Archaeological and Cultural Mitigation Measures

Mitigation measures generally used by the Navy to offset or eliminate potential impacts of archaeological and cultural resources include avoidance of operations and construction in areas where cultural resources are known to exist~~or~~ and monitoring of all ground disturbing and construction in areas where cultural resources are known to exist. Personnel are briefed that they are working in a culturally sensitive area and on the Federal laws protecting the resources within that area. In or near areas where missile launch activities take place, mitigations include the spraying of water on vegetation within the immediate vicinity surrounding the launch vehicle prior to launch. Care is taken to ensure surfaces of plants have sufficient time to dry before the launch. In the event ignition of vegetation does occur, fire suppression personnel are instructed to use an open spray nozzle, whenever possible, rather than a directed stream to quell the fire. This minimizes erosion damage to areas (such as the sand dunes) and prevents possible destruction of potential cultural resources. If extensive burning of dune vegetation should occur, post-burn archaeological surveys would be conducted in consultation with the SHPO anda U.S. Navy Archaeologist. If cultural resources are discovered as a result of normal training and operations and base operations maintenance activities, a full or sample data recovery/research and documentation program (i.e., controlled excavation) is implemented.

In all cases where human burials are discovered or inadvertently disturbed as a result of ground-disturbing activities, the activity within the area of this discovery immediately ceases. The remains are treated in accordance with the procedures specified in the NAGPRA and the National Historic Preservation Act. This includes notification of the PMRF Environmental Engineer the U.S. Navy Archaeologist, SHPO Hawaii (which includes the Kauai Island Burial Council, Hui Malama I Na ~~Kapuna~~ Kupuna O Hawaii Nei) and the Office of Hawaiian Affairs. The decision with regard to final disposition of any human remains that may be encountered is made in consultation with the above-mentioned agencies and individuals. Options for disposition of remains include:

- Avoidance of the burial site
- Re-interment of the remains
- Curation of the remains until a decision regarding their final disposition is made

In the event that osteological analysis of skeletal material is required, arrangements for the services of a physical anthropologist with a background in human osteology will also be made. Analysis will be performed with nondestructive methods. No off-island analysis of human remains is conducted. Any activities related to cultural resources identification and evaluation will be conducted in conformance with the Secretary of the Interior s Standards and Guideline for Archaeology and Historic Preservation.

3.1.1.5 Geology and Soils— PMRF/Main Base

Geology and soils are considered earth resources that may be adversely affected by proposed activities. This resource is described in terms of existing information on the land forms, geology, and associated soil development as it may be sub ect to erosion, flooding, mass wasting, mineral resource consumption, contamination, and alternative land uses resulting from proposed construction and launch activities.

3.1.1.5.1 Region of Influence

The region of influence for geology and soils is the land within the PMRF/Main Base, specifically, those areas directly disturbed by new construction of the Target Launch Facility, Interceptor Launch Area, and the associated launch hazard area.

3.1.1.5.2 Affected Environment

3.1.1.5.2.1 Physiography

PMRF/Main Base is situated on a strip of low-lying coastal terrace called the Mana Plain. The plain bounds the western flank of the island forming gentle westerly slopes ranging from about 2 percent near the volcanic uplands, to relatively flat over the coastal margin occupied by PMRF/Main Base. The plain does not form cliffs at the PMRF/Main Base shoreline. Local relief is formed by low beach barrier dunes, mildly undulating blanket sands, and the more prominent Nohili Dune located at the northern portion of PMRF/Main Base, ad acent to the northwest side of KTF at Nohili Point. Ground elevations over the facility average between 3 m (1 ft) to .1 m (2 ft) rising to 3 . m (1 ft) at Nohili Dune. PMRF/Main Base is not traversed by perennial or ephemeral streams. Surface runoff is controlled by manmade channels located at Nohili Ditch on northern PMRF/Main Base, Kawaiele Drainage in central PMRF/Main Base, and a drainage ust south of Kawaiele Drainage.

3.1.1.5.2.2 Geology

The Island of Kauai is the result of a massive shield volcano, part of the chain of similar volcanoes that migrated northwest to southeast to form the Hawaiian archipelago. Kauai is the oldest of the eight main islands. Volcanic rocks exposed in the western half of theisland are composed of Pliocene basaltic flows of the Waimea Volcanic Series (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-2). The volcanic terrain forms an abrupt, crescent-shaped 13
scarp at the eastern boundary of the Mana Plain, the result of wave action from a higher sea stand. The surface of the volcanic basement complex plunges beneath the Mana Plain at approximately degrees (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3). 13

The Mana Plain is composed of alluvium, lagoon, beach, and dune deposits that overlie the volcanic basement. This sedimentary sequence forms a wedge which thickens east to west, attaining an approximate thickness of 1 m (2 ft) at the eastern base boundary, increasing to about 122 m (ft) at the coast (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3). Older and younger terrestrial alluvium interfingers with gypsum bearing clayey lagoonal 13
deposits and marine near-shore deposits at depth. Sediments are characteristically red and brown nearer the volcanic outcrops, grading to tan andgray calcareous sand near the coast.

The surface of the Mana Plain typically consists of loose sand associated with younger (Modern) alluvium and flattened dunes with little relief (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3). The dune sands can be of substantial thickness along the 13
coastal margin where they have been reported to be in excess of 12.8 m (2 ft) thick at the Kokole Point housing area (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3). The 13
dunes are composed of loose fine sand and silty sand that is weakly to stronglyindurated (hardened) a few meters below ground surface. This indurated surface can form resistant remnants, or fossil dunes, fronting the beach along some reaches of the PMRF shoreline. The beach berm is about 3 m (1 ft) high and is breached only where drainage canals have been excavated at Nohili and Kawaiele (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3). 13

Coral reefs developed upon the eroded platform around the island when the sea was about 1. m (ft) above its current level (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3). 13
Wave action has eroded the coral surface, creating a primary source for beach sand which is actively being deposited and reworked along the shoreline. Beach sand is generally medium to coarse grained.

3.1.1.5.2.3 Soil

The U.S. Department of Agriculture (USDA) Soil Conservation Service published a soil survey that includes the surficial deposits of the Mana Plain (PMRF and Easement areas). The dominant soil within the PMRF area has been mapped as Jaucas loamy fine sand, to 8 percent slopes (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-). The USDA 13
describes this soil as occurring on old (inactive) beaches and on windblown sand deposits. It is pale brown to very pale brown sand, and in some cases it is more than 1. m (ft) deep. In many places, the surface layer is dark brown as a result of accumulated organic matter and alluvium. The silt is neutral to moderately alkaline through its profile. It has an

available water capacity of .1 to .2 cm/m (. to . in./ft) of soil (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-). The soils are permeable, and infiltration is rapid. Wind 13
erosion is severe when vegetation has been removed.

Along the ocean margin of PMRF/Main Base are areas of active dunes and beaches. Dune lands consists of hills and ridges of sand drifted and piled by the wind. The hills and ridges are actively shifting, or so recently stabilized that no soil horizons have developed. The sand is chiefly calcareous, derived from coral and seashells (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-). 13

Soil samples at the Vandal launch site were obtained to determine if lead concentrations exceeded the mg/kg cleanup goal established by the State of Hawaii Department of Health for residential use. No site soil samples had lead concentrations exceeding the limit prior to the 1 Vandal launches. After five 1 launches, two sites contained lead concentrations exceeding mg/kg. Both of these sites were located within 1 m (ft) of the launch site. Concentrations of lead 3 . m (1 ft) away in the same direction were only 3 and mg/kg. None of the lead concentrations outside this 3 . -m (1 -ft) range were above the reporting limit. (U.S. Department of the Navy, Jan p. 3 through) 1

Vandal target missile launches from PMRF ~~LC launch complex~~ appear to cause elevated lead concentrations in soil only within 3 . m (1 ft) of the launch mechanism. The location of these soil samples suggests that lead concentrations do not pose an immediate risk to human health because the launch pad is restricted from public access and that none of the contaminated sand has been or will be transported to the beach.

A study was conducted by the DOE to determine if elevated aluminum concentrations occur at PMRF/Main Base as a result of their rocket emissions. Analysis of background aluminum levels from Mana Plain soils ranged from to 1 ,3 milligrams/kilogram (mg/kg) (.2 to 1.1 ounces per pound oz/lb). Kauai soil aluminum values range from . to . oz/lb. Deposits of gibbsite, the trihydrate of aluminum oxide, occur naturally in the high rainfall areas of windward Kauai (Land Study Bureau, 1 , Dec, p.2). The study suggested that if there has been an increase in the amount of aluminum in the soil at PMRF/Main Base as a result of rocket emissions, the total amount is still less than nearby soils.

The DOE also tested for lead and found levels up to 2 mg/kg and indicated that these were not actionable levels (U.S. Army Strategic Defense Cpmmand, 1 2, Feb, p.3-). 13
report described studies of lead poisoning in children, which found that levels of lead of 3 to mg/kg (3 to parts per million ppm) are acceptable. An additional study of the soils of the Mana Plain and KTF area revealed that chloride and pH do not indicate residual effects from past missile launches at KTF.

3.1.1.6 Hazardous Materials and Hazardous Waste— PMRF/Main Base

Hazardous materials and hazardous waste management activities at PMRF are governed by specific environmental regulations. For the purposes of the following analysis, the terms hazardous materials or hazardous waste will mean those substances defined by both Federal and State regulations. In general, this includes substances that, because oftheir quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare or the environment when released into the environment. Hazardous waste is further defined in CFR 2 1.3 as any solid waste that possesses any of the hazard characteristics of toxicity, ignitibility, corrosivity, or reactivity, oris a listed waste.

Solid waste is defined as any discarded material (in effect, abandoned, recycled, inherently waste-like, or no longer suitable for its intended purpose) that is not specifically excluded in CFR 2 1. . This definition can include materials that are both solid and liquid (but contained).

3.1.1.6.1 Region of Influence

The region of influence encompasses the current property boundaries of PMRF/Main Base and all geographical areas that might be affected by a release of a hazardous substance from No-action Alternative actions and TBMD and TMD related activities.

3.1.1.6.2 Affected Environment

3.1.1.6.2.1 Hazardous Materials

PMRF manages hazardous materials through the Navy s Consolidated Hazardous Materials Reutilization and Inventory Management Program (CHRIMP). CHRIMP mandates procedures to control, track, and reduce the variety and quantities of hazardous materials in use at facilities. The CHRIMP concept established Hazardous Materials Minimization Centers (HA MINCENs) as the inventory controllers for Navy facilities. All departments, tenant commands, and work centers must order hazardous materials from the HA MINCENs, where all such transactions are recorded and tracked. The exception to this is KTF, which obtains its hazardous materials through DOE channels. Hazardous materials on PMRF are managed by the operations and maintenance contractor. Hazardous materials managed through the CHRIMP program other than fuels are stored in Building 338. Typical materials used on PMRF/Main Base and stored at Building 338 include cleaning agents, solvents, and lubricating oils.

PMRF has management plans for oil and hazardous materials outlined in the *PMRF Spill Prevention Control and Countermeasures Plan* and the *Installation Spill Contingency Plan,* both of which also regulate tenant organizations and PMRF associated sites. (U.S. Army Space and Strategic Defense Command, 1 2, Feb, p.3- 1) Specifically, sites included are 13
KTF, Makaha Ridge, Kokee, Kamokala Magazines, and Port Allen.

PMRF has developed programs to comply with the requirements of the SARA Title III and Emergency Planning and Community Right-to-Know Act (EPCRA). This effort has included submission to the State and local emergency planning committees of annual Tier II forms, which are an updated inventory of chemicals or extremely hazardous substances in excess of threshold limits. These chemicals at PMRF include et fuel, diesel fuel, propane, gasoline, aqueous fire fighting foam, chlorine, used oil, paint/oils, and paint.

PMRF uses gasoline and diesel fuels to power range trucks and equipment. There are two gas stations on PMRF/Main Base: a Navy Exchange gas station with a capacity of

18, 2 L (, gal) and a second gas station in the vicinity of the Administrative Area with a capacity of 32,1 L (8, gal) for dispensing gasoline to military vehicles. (U.S. Department of Defense, 1 1, Sep, p.13) Aircraft at PMRF utilize et fuel, JP-1 and Jet-A. Jet-A and JP- 1 8
1 fuels are available at the fuel farm near the airfield, and are delivered to the flight line in refuelers.

Operations at KTF on PMRF/Main Base involve the use of numerous hazardous materials. The bulk of these hazardous materials has been rocket fuels. Hazardous materials are also used for equipment maintenance (cleaning solvents) and small amounts of pesticides. Liquid rocket propellants (hydrazine and NTO) are transported, handled, and stored on KTF. (U.S. Army Program Executive Office, 1 , May, p.3-12) The liquid propellants described in this 12
document, including IRFNA, would be handled following procedures similar to those used for hydrazine and NTO.

3.1.1.6.2.2 Hazardous Waste

PMRF/Main Base is a large-quantity generator with a U.S. Environmental Protection Agency (USEPA) number. Hazardous waste on PMRF is not stored beyond the -day collection period. In 1 , PMRF/Main Base generated ,21 kg (88, lb) of hazardous waste. Pollution prevention programs at PMRF have resulted in a significant reduction in the amount of hazardous waste generated when compared to the 88,8 kg (1 , lb) generated in 1 . Table 3.1.1. -1 contains the summary of hazardous wastes generated and their quantities on PMRF/Main Base.

PMRF/Main Base has two accumulation points on base for hazardous wastes Building 3 2 and Building 1 . Building 3 2 accumulates all base waste except for otto (torpedo) fuel, a liquid monopropellant. Building 1 is the torpedo repair shop. At present, both buildings are not used at their maximum hazardous waste storage capacity. KTF has one accumulation point.

Makaha Ridge and Kokee generate only used oil, which is recycled. Port Allen generates used oil, paint wastes, and oily bilge water. The oily bilge water is processed through an oil/water purification unit and then is fed into the nearby sewage treatment plant. (Inouye, 1 , 1 Sep, p.1 through 2) 3

Under State regulations oil is not regulated as a hazardous waste, but is a hazardous substance sub ect to notification. (Naval Supply Systems Command, 1 , p.C-) PMRF 3
outlines management and disposal procedures for used oils and fuels in the Hazardous Waste Management Plan. Additionally, degraded et fuel is used in crash-fire training exercises. In 1 , 2, 21 L (gal) were used in this method. (Naval Supply Systems Command, 1 , p.C-) 3

The ma ority of wastes are collected and containerized at PMRF/Main Base for direct offsite disposal through the DRMO at Pearl Harbor within days. (U.S. Army Space and Strategic Defense Command, 1 2, Feb, p.3- 1) The DRMO provides for the transportation and 13
disposal of the wastes to the final disposal facility. (U.S. Army Program Executive Office, 1 , May, p.3-12) 12

Table 3.1.1.6–1: CY96 Hazardous Waste Annual Report for PMRF*

USEPA Number	DOT Number	Waste Description	Quantity Backlog in kg (lb)	Quantity Stored in kg (lb)	Quantity Disposed in kg (lb)	Location of Disposal
D 1	3	Battery, Lithium			13 .2 (28)	D
D 2	2	Battery, Fluid			1 1.1 (311)	D
D	3	Soil, Contaminated			1,1 . (2, 3)	D
NRCR	2212	Asbestos			1, . (2,32)	D
D 1	1 3	Gasoline			32 . ( )	D
D 1	12 3	Gasoline			3 (8)	D
D 1	12 3	Paint Related Material			3 ( )	D
D 8	3 82	Oil			1 . (18)	D
D 1	1 3	Methanol			. (121)	D
D 2	2 2	Ammonia Solution			11.3 (2)	D
D 8	3	Sand Blast Material			, 8. (8, 2)	D
D	3	Otto Fuel, Solid	3 1. ( )	131. (2)	, 1.3 (1 , 3)	F
D	3 82	Otto Fuel, Liquid	,833 (1 ,)	1,83 . (,)	18, 88 (,)	F
D 1	1 3	Isopropyl Alcohol	3 . ( )	3. (1,)	2 .8 (1,)	F
D	3 82	Sea Water/ Otto Fuel	,3 . (11,8)		, .3 (1 , 1)	F
		TOTALS:	12, . (28, 1)	2, 1 . (,33)	,213. (88,)	

Source: Naval Supply Systems Command, 1 , Appendix C, Part E. 73

***Table does not include recycled wastes of mercury tubes and lead-acid batteries. These quantities are addressed in the Pollution Prevention portion of this section.**

~~N Onsite (Navy property)~~
F Offsite (contractor)
D DRMO (DRMO contractor or DRMO custody)

KTF on PMRF/Main Base is a small-quantity generator and has ~~obtained~~ a USEPA identification number. (U.S. Army Program Executive Office, 1 , May, p.3-12) KTF has not 12 generated enough hazardous waste for disposal since becoming a small quantity generator in 1 . (Lautenschleger, 1 , 1 Sep, p.2 through 3)

The Visual Imaging Service Center located in the Photo Lab in Building 3 uses an electrolytic silver recovery system and thereby eliminates silver-containing waste discharge. (Inouye, 1 , 22 Oct)

3.1.1.6.2.3 Pollution Prevention

PMRF has a pollution prevention plan in place for Main Base and all sites on Kauai, which was
updated in February 1 . (Naval Supply Systems Command, 1 , p.C-2) In regards to 3
hazardous waste elimination programs, PMRF/Main Base currently has three in place. These
involve the recycling of toner cartridges, mercury from mercury lamps, and acid/lead batteries.
(Naval Supply Systems Command, 1 , p.C-) In calendar year 1 , 2 kg (1,3 lb) of 3
fluorescent tubes containing mercury were recycled, as well as 2 8 kg (8 lb) of acid/lead
batteries. **(**Naval Supply Systems Command, 1 , Appendix C, Part E**)** Additionally, all spent 3
toner cartridges were sent to the manufacturer for recycling. The Hazardous Waste Management Plan, dated October 1 , provides for the requisition, inventory, substitution, reduction, and disposition of hazardous materials. The Plan provides guidance for the storage to ensure segregation for compatibility and management of inventory to comply with shelf-life and expiration dates and minimize waste. The usage, spill prevention and spill response are addressed in the Plan. Additionally, waste minimization is accomplished through source reduction and recycling. The Hazardous Waste Management Plan identifies responsible persons and provides for training. The Plan includes requirements for packaging and labeling, periodic inspections, inventory control, and tracking. PMRF also has a formal hazardous material and used oil recycling program and a used solvent elimination program.

3.1.1.6.2.4 Installation Restoration Program

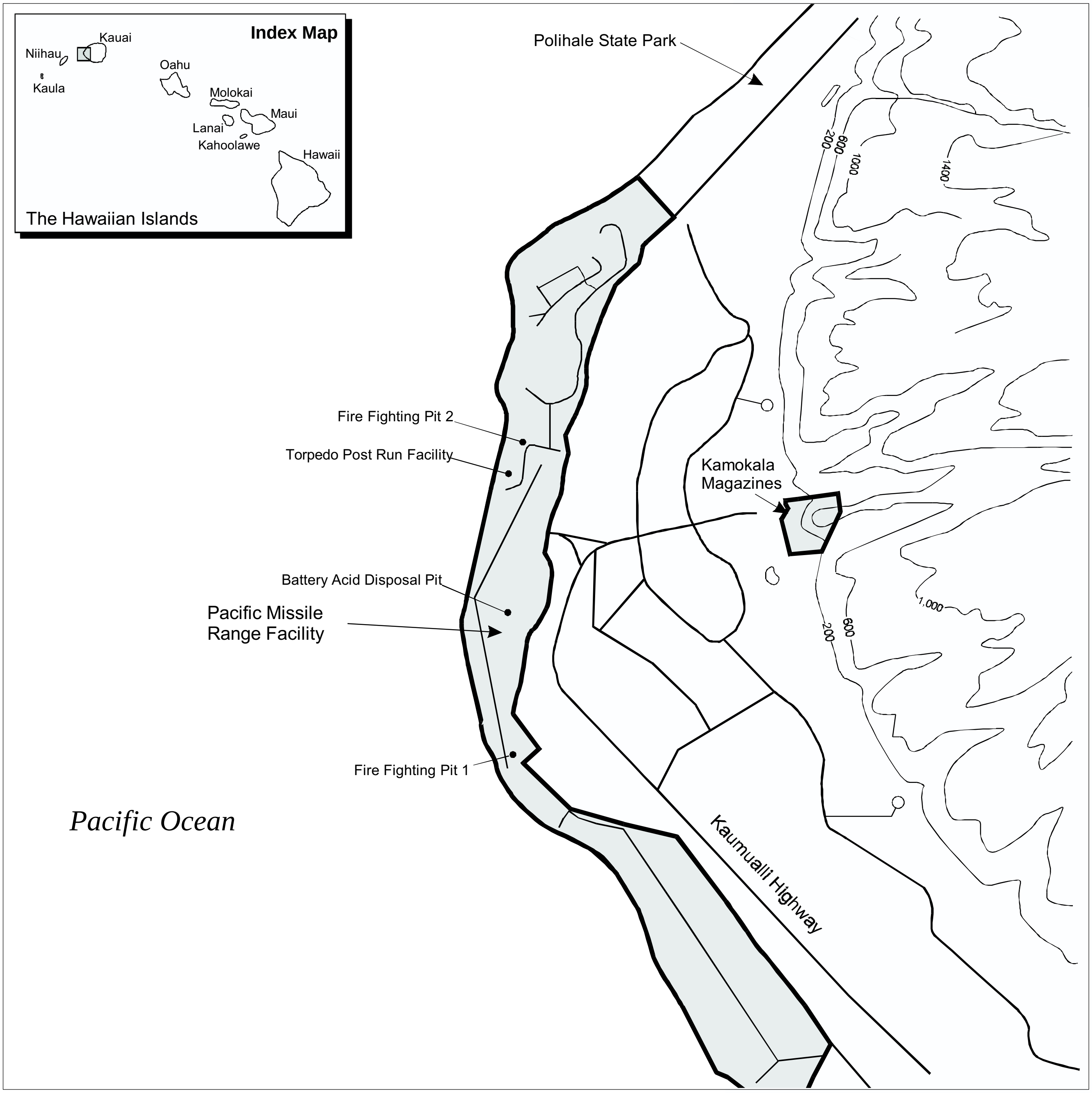
PMRF/Main Base has four IRP sites: two fire fighting training pits, one torpedo leach field, and one battery acid pit (figure 3.1.1. -1). ~~Three of these sites are in the process of closure, including o~~One of the fire fighting pits (Pit No. 2), the torpedo leach field, and the battery acid pit are in the process of closure. These three sites ~~that are in the process of closure~~ require no further cleanup. (Inouye, 1 , 22 Oct). PMRF is working with the State on closure of fire fighting Pit No. 1.

3.1.1.6.2.5 Storage Tank Management

PMRF/Main Base has nine 18 ,2 -L (, -gal) underground storage tanks (USTs) and ten smaller USTs containing petroleum products. All USTs are equipped with a vapor detection system. The tanks were tested approximately years ago, with no leaks detected. (Naval
Facilities Engineering Command, 1 , Jan, p.31) Eight of the smaller USTs consist of 2
double-walled fiberglass reinforced plastic ~~USTs~~ and piping.

3.1.1.6.2.6 Pesticide Management

The Federal Insecticide, Fungicide, and Rodenticide Act regulates the registration and use of pesticides. Title of the Hawaii Code of Rules and Regulations, Chapter , provides for the registration, licensing, certification, recordkeeping, usage, and other activities related to the safe and efficacious use of pesticides. Insecticides account for the ma ority of the pesticides used at PMRF/Main Base. At PMRF/Main Base, pesticides are stored in Building 232. All pesticides are applied by certified applicators. Pesticides are applied on a demand basis with no set or routine schedule.



EXPLANATION

- Pacific Missile Range Facility
- Installation Restoration Program Site
- Pacific Missile Range Facility Boundary
- 200 Contour Lines (ft)

NORTH

Scale

2 1, Meters

2,3 , Feet

Installation Restoration Program Sites on Pacific Missile Range Facility

Kauai, Hawaii

Figure 3.1.1.6-1

3.1.1.6.2.7 Radon Management

Radon is a naturally occurring colorless, odorless, radioactive gas that is produced by the radioactive decay of naturally occurring uranium. Radon that is present in the soil, however, can enter a building through small spaces and openings, and accumulate in closed areas. The cancer risk caused by exposure (inhalation) of radon gas is currently an area under serious investigation in the scientific community. Residential radon measurements in Hawaii average less than .1 picocurie per liter, the lowest of all states. No radon issues have been identified at PMRF/Main Base. (Bondad, 1 , 23 Oct, p.1)

3.1.1.6.2.8 Ordnance Management

The disposal of ordnance is regulated by RCRA. Unserviceable ordnance is disposed of in accordance with PMRF Instruction (PMRFINST) 8 2 .1B, *Disposal of Unserviceable Ammunition and Explosives,* dated 28 March 1 . The hazards of ordnance and other hazardous materials are often increased by uncontrollable factors that cause their unserviceability. Regardless of the type or condition of unserviceable ordnance, these materials are handled under the supervision of qualified Explosives Ordnance Disposal (EOD) personnel. The EOD team from Explosives Ordnance Mobile Unit Three (EODMU Three), Naval Magazine West Loch, is the closest EOD response team. EODMUThree will render ordnance safe when requested by PMRF.

3.1.1.6.2.9 Polychlorinated Biphenyls Management

Commercial PCBs are industrial compounds produced by the chlorination of certain hydrocarbons. Historically, PCBs were used as liquid coolants in industrial equipment and as insulators in electrical transformers and capacitors. Their manufacture was banned in 1 8 by the Toxic Substances Control Act (TSCA). They are not regulated by RCRA, but are designated as a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) due to the Clean Water Act (CWA). Therefore, any person identified as a responsible party in a release or threatened release of PCBs is liable for any and all costs incurred for the cleanup. Under Title III of SARA, the reportable quantity is . kg (1 lb).

PCBs found at PMRF/Main Base are contained in fluorescent lamp ballasts and capacitors in certain electronic equipment, which are currently in use. If the component containing PCBs becomes waste, the waste will be labeled according to TSCA, CFR 1, requirements for shipping, and disposed of through the DRMO or a contractor within 1year of the waste s initial storage.

3.1.1.6.2.10 Medical and Biohazard Waste Management

Currently, the USEPA does not regulate infectious wastes, though it has clear statutory domain to do so under 2 USC 3( ). For regulatory purposes, Federal regulations allow States to regulate medical wastes. The Hawaii regulations governing the management, treatment, transport, storage, and disposal of medical and infectious wastes and treated infectious wastes ensure practices that will protect the health and safety of persons living in Hawaii.

PMRF/Main Base has a dispensary located in Building2 8 which provides limited emergency care for active duty personnel. Medical wastes generated by the dispensary are containerized and shipped to Barbers Point in accordance with Navy regulations. (Inouye, 1 ~~22~~ 2 Oct) 1

3.1.1.6.2.11 Radioactive Waste Management

Radioactive materials are not considered a hazardous waste unless mixed with a listed RCRA hazardous waste, or the low level hazardous wastes exhibit the characteristics of a hazardous waste. Radioactive materials are treated as hazardous materials for administration. At least to months before any radioactive material may be brought onto PMRF, the Command must be notified through a Program Introduction document and approval granted. The PMRF Launch Ordnance Office will consider blast, sound, toxicity, radiation, and other effects that may constitute a hazard to personnel or facilities. There is presently no radioactive material on PMRF or any of the support facilities that requires regulatory licensing (Inouye, 1 , 2 Oct) 1

3.1.1.6.2.12 Lead-based Paint Management

Lead exposure to humans and animals has been determined to be a health risk. To minimize exposure to lead from dust, paint, and soils, Section 12-1 8.1-1 of the Hawaii Code of Rules and Regulations incorporates the U.S. Department of Labor and Occupational Safety and Health Administration (OSHA) standard for lead in construction, 2 CFR 1 2 . 2.

PMRF has initiated a lead paint inventory and management plan that characterizes the status and disposal of lead-based paint. Preliminary results of the survey found no lead-based paint in the newer residential units of base housing and none in the Child Development Center. Some lead-base paint was found in the older residential units of base housing. (~~Personal comm. J. Unmack with R.~~ Inouye, 1 , 2 Oct) 1

All facilities associated with PMRF follow its lead-based paint management plan. The exception is KTF, which follows DOE plans for the removal of lead-based paint wastes.

3.1.1.6.2.13 Asbestos Management

Asbestos is regulated by USEPA, OSHA, and the Hawaii Department of Labor and Industrial Relations. Specifically, asbestos is regulated under the Clean Air Act, the Occupational Safety and Health Act, TSCA, CFR 3, and Title 12 of the ~~Hawaii Code of~~ Administrative Rules ~~and Regulations~~, Chapter 1 .1, *Asbestos*.

PMRF is currently conducting an asbestos survey for the family housing on the base. Preliminary results of the asbestos survey found asbestos in the floor tile and mastic of many of the office buildings on PMRF. No asbestos was found in the Child Development Center. (~~Personal comm. J. Unmack with R.~~ Inouye, 1 , 2 Oct). PMRF manages asbestos in 1 accordance with the base asbestos management plan. Prior to any construction pro ects, areas to be disturbed are surveyed for asbestos, and any asbestos is removed, prior to disturbance, by a certified asbestos contractor.

KTF follows DOE plans for dealing with asbestos.

3.1.1.7 Health and Safety— PMRF/Main Base

3.1.1.7.1 Region of Influence

The region of influence for health and safety includes PMRF and the areas affected by training, testing, and shipment of hazardous materials. These areas include the Island of Kauai and the PMRF overwater training areas.

3.1.1.7.2 Affected Environment

The Navy takes every reasonable precaution during the planning and execution of the operations, training exercises, and test and development activities to prevent in ury to human life or property. In addition to explosive, physical impact, and electromagnetic hazards, potential hazards from chemical contamination, ionizing and non-ionizing radiation, radioactive materials, and lasers are studied by the Naval Air Warfare Center, Weapons Division. (U.S. Department of Defense, 1 1, Sep, p.28) 1 8

3.1.1.7.2.1 Fire and Crash Safety

The Navy has developed standards that dictate the amount of fire/crash equipment and staffing that must be present based on the number and types of aircraft stationed on base, and the types and total square footage of base structures and housing. The PMRF fire department meets these standards by maintaining three P-1 (two primary and one backup) crash trucks with both water and foam delivery capacities. For structural fires, the fire department maintains two combinations of structural fire trucks (one primary and one backup), and one brush fire truck as required by Navy standards for an installation the size of PMRF. One centrally located facility houses the equipment for both the flightline and the structure fire protection needs. The positioning of this facility also meets the Navy time and distance requirements for facility response.

In addition to fire equipment, PMRF has two ambulances and Emergency Medical Technician available 2 hours a day, days a week.

3.1.1.7.2.2 Aircraft Safety

The threats to human safety from aircraft accidents at PMRF are summarized in the Navy Air Installation Compatible Use one (AICU) Report. The purpose of the AICU report is to evaluate the effects of aircraft noise and accident potential, and develop and establish a means to ensure the health, safety, and welfare of the citizens of the surrounding communities while protecting the operational capabilities of PMRF. Naval Operations Instruction (OPNAVINST) 11 1 .3 A, *Air Installations Compatible Use Zones (AICUZ) Program,* dated 11 April 1 8, and NAVFAC P-8 .3, *Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations, Appendix E, Airfield Safety Clearances,* provide the principal guidance for naval commands regarding AICU and airfield safety clearance issues. In order to minimize the risk to the public at each end of the runway, a Clear one and Accident Potential ones have been designated. These airfield safety zones are either over open water or contained within the PMRF/Main Base boundary. (U.S. Department of the Navy, 1 , Oct, p.D-2 through D-2) 1

Overall aircraft safety operations at PMRF are contained in PMRFINST3 1 .11E, *Air Operations Manual*. This document provides general operating procedures for aircraft operations including radar hazard avoidance areas for ordnance, NOTAMs, red label operations, aircraft arrival and departure procedures, and flight rules for overflight of the islands of Kauai and Niihau. Flights over the Island of Kauai would comply with FAA guidelines and local course rules, and populated and resort areas shall be avoided. The Island of Niihau shall not be overflown except as previously arranged Navy site support missions. No mishaps involving PMRF aircraft have affected the public.

Red Label Area

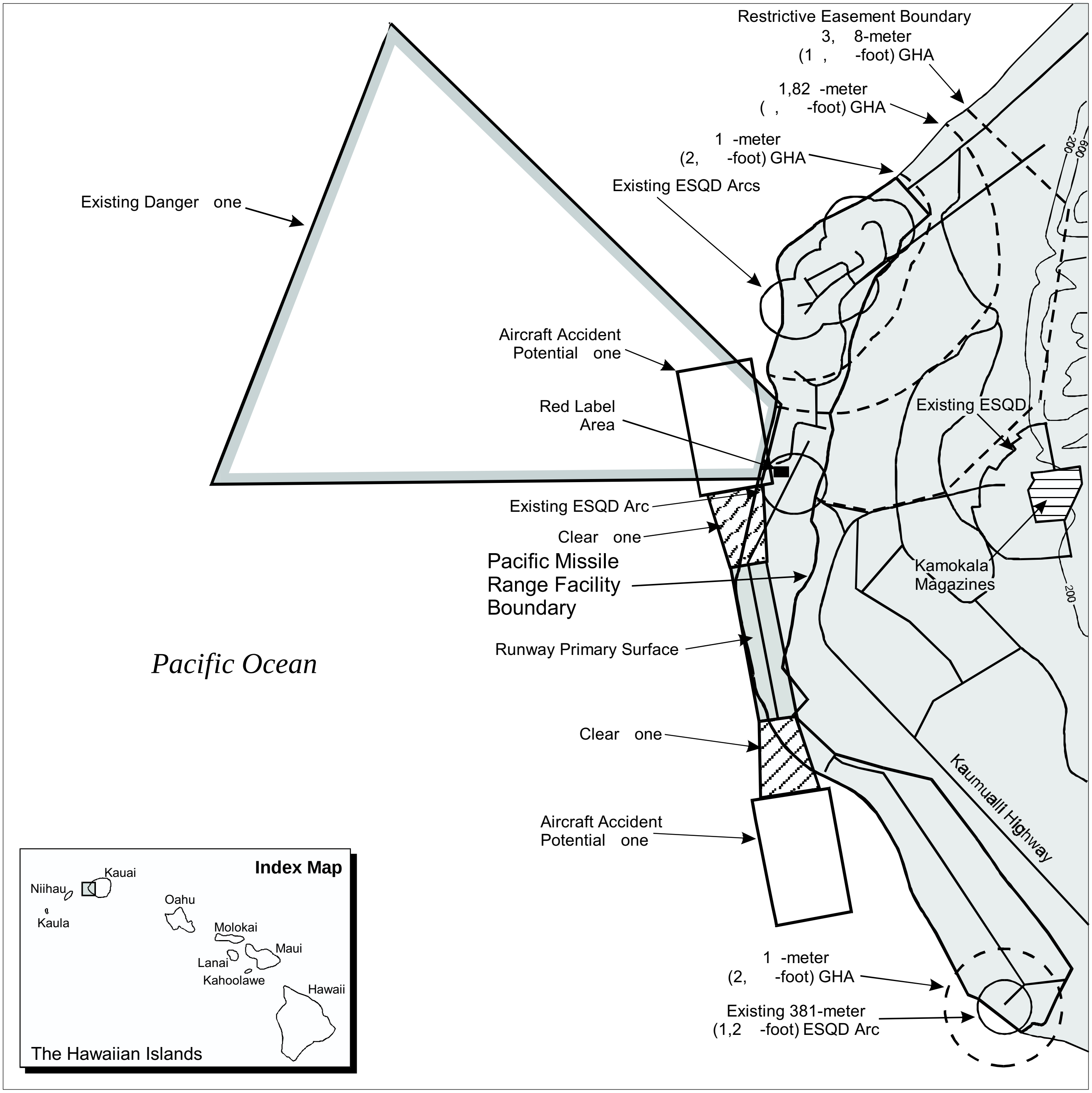
A 381-m (1,2 -ft) ESQD Red Label Area, to handle incoming and outgoing ordnance items, is centered on the airfield taxiway, 381 m (1,2 ft) from Building 12 (see figure 3.1.1. -1). A soft pad in the Red Label recovery area is used by helicopters for setting down targets and weapons recovered from the range. The 2 -m (8 -ft) ESQD surrounding the soft pad falls totally within the Red Label ESQD area. (Pacific Missile Range Facility, 1 , 1 Nov, p.8-3) 8

3.1.1.7.2.3 Range Safety

All range users must: (1) provide a list of pro ect materials, items, or test conditions that could present hazards to personnel or material through toxicity, combustion, blast, acoustics, fragmentation, electromagnetic radiation, radioactivity, ionization, or other means (2) describe radiation, toxic, explosive, or ionization problems that could accumulate as a result of their tests (3) provide warhead information (if any), aerodynamic and flight control information, and destruct system information and parameters ( ) submit plans, specifications, and procedural or functional steps for operations involving explosives to conform to criteria in the Naval Air Warfare Center, Weapons Division instruction and ( ) provide complete operational specifications of any laser to be used and a detailed description of its planned use. (U.S. Department of Defense, 1 1, Sep, p.2) In addition, the following range safety measures are taken. 1 8

Missile Flight Analysis

PMRF conducts missile flight safety, which takes into account potential hazards from chemical contamination, ionizing and non-ionizing radiation, radioactive materials, and lasers in accordance with Naval Air Warfare Center Weapons Division Instruction (NAWCWPNSINST) 1 .2. This includes analysis of missile performance capabilities and limitations, of hazards inherent in missile operations and destruct systems, and of the electronic characteristics of missiles and instrumentation. It also includes computation and review of missile tra ectories and hazard area dimensions, review and approval of destruct systems proposals, and preparation of the Range Safety Approval and Range Safety Operational Plans required of all programs at PMRF. These plans are prepared by the Naval Air Warfare Center, Point Mugu, for each program and must be in place prior to pro ect initiation.



EXPLANATION

– – – Existing Ground Hazard Areas

200 Contour Lines (ft)

ESQD Explosive Safety Quantity Distance
GHA Ground Hazard Area

NORTH

Scale

1, Meters

2, 8 ,21 Feet

Pacific Missile Range Facility Health and Safety (Revised)

Kauai, Hawaii

Figure 3.1.1.7-1

pmrf hs 1

Laser Safety

Range Safety Approval must include laser safety specifications before a laser can be used outdoors at PMRF. Potential range users of lasers must provide complete operating specifications of their laser and a detailed description of the planned use. An independent safety analysis is made by the Laser Safety Officer of the Naval Air Warfare Center, Weapons Division. Laser operations will comply with laser safety requirements in the Range Commanders Council document RCC-31 - . Currently, no lasers are used at PMRF.

Explosive Safety

Ordnance safety includes procedures to prevent premature, unintentional, or unauthorized detonation of ordnance. Any program using a new type of ordnance device for which proven safety procedures have not been established requires an Explosive Safety Approval before the ordnance is allowed on PMRF or used on a test range. This approval involves a detailed analysis of the explosives and of the proposed operations, procedures, and facilities for surveillance and control, an adequacy analysis of movement and control procedures, and a design review of the facilities where the ordnance items will be handled.

Radiation Safety

All programs planning use of radioactive materials or machines which produce ionizing radiation must secure approval from the Radiation Safety Officer and the Radiation Safety Committee of the Naval Air Warfare Center, Weapons Division, before such operations can be conducted at PMRF. The Radiation Safety Officer reviews proposals, identifies radiation sources and their intended use, and recommends essential conditions to ensure safety to the Radiation Safety Committee. The committee then approves, conditionally approves with additional requirements, or denies the request for the use of radioactive materials. All programs using ionizing radiation materials at PMRF must meet the Nuclear Regulatory Commission s license requirements, unless those programs are uniquely military, and then the Navy RAD-1 license requirements apply. Currently, no radioactive material is used at PMRF.

Electromagnetic Radiation Management

Electromagnetic radiation (EMR) zones designated around transmitter sites and tracking radars are required where high density electromagnetic power may constitute a hazard to personnel (Hazards of Electromagnetic Radiation to Personnel HERP), explosives (Hazards of Electromagnetic Radiation to Ordnance HERO), or fuels (Hazards of Electromagnetic Radiation to Fuels HERF), or may interfere with nonmilitary electronic equipment. All programs at PMRF are conducted in accordance with COMPMTCINST 1 .1 , *Radiological Safety Manual* (U.S. Army Program Executive Office, 1 , May, p. -13). The hazard levels 12
associated with HERP are promulgated by OPNAVINST 1 .23B Chapter 3, *Navy Occupational Safety and Health Program Manual*. PMRF uses a combination of establishing safety zones and conducting sector blanking in occupied areas to avoid potential ~~electromagnetic radiation (~~EMR~~)~~ exposure. To ensure exposure risks to personnel are minimal, the Navy conducts regular radiation hazard surveys before any

modifications to a unit are made or when new radar equipment is installed. In addition, all radar units have red (radar unit is on) and blue (radar unit is emitting EMR) warning lights. EMR generated from PMRF radar units does not expose the public to any hazardous radiation.

3.1.1.7.2.4 Ordnance Safety

PMRF s ordnance safety measures minimize hazards and prevent exposure of personnel and property to unnecessary risks. Procedures governing these measures are found in PMRFINST 8 2 . , *Explosive Safety Criteria for Range Users Ordnance Operations*. The Range Control Branch of the Range Programs Division is responsible for: (1) detailed analysis of all proposals concerning missiles or explosives and their proposed operation on the range (2) establishing procedures for surveillance and control of traffic within and entering hazard areas (3) reviewing the design of facilities in which ordnance items are to be handled to ensure that safety protection meets the requirements of Naval Sea System Command Publication (NAVSEAOP) - , *Ammunition and Explosives Ashore; Safety Regulations for Handling, Storing, Production, Renovation, and Shipping*, Chapter ( ) training, certifying, and providing Launch Control Officers, Safety Monitors, and Ordnance personnel for operations involving explosive ordnance ( ) assuming responsibility for the control of all emergency facilities, equipment, and personnel required in the event of a hazardous situation from a missile inadvertently impacting on a land area ( ) providing positive control of the ordering, receipt, issue, transport, and storage of all ordnance items and ( ) ensuring that only properly certified handling personnel are employed in any handling of ordnance. When an approved procedure is not available for a range user s ordnance item, the safety specifications in a PMRF-prepared Explosive Safety Approval are followed. (U.S. Department of Defense, 1 1, Sep, p.2) 1 8

Ordnance Management

Ordnance is delivered to PMRF/Main Base by aircraft to the on-base airfield and by ship to Nawiliwili Bay then over land by truck transport along Highway to the base. The barges carrying explosives are met at Nawiliwili Harbor by trained ordnance personnel and special vehicles for transit to and delivery at PMRF. All ordnance is transported in accordance with DOT regulations. Ordnance is stored in caves at the Kamokala Magazine area, except for the Strategic Target System, which is stored in a specially constructed facility on KTF. (Inouye, 1 , Jan, p.1) No mishaps involving the use or handling of ordnance have occurred at 3
PMRF.

PMRF/Main Base has defined ESQD arcs. The arcs are generated by launch pads, the Kamokala Magazine ordnance storage area, the Interim Ordnance Handling Pad, and the Missile Assembly/Test Buildings 3 and 8 . Only the ESQD arcs generated bythe Interim Ordnance Handling Pad and Building 3 are covered by a waiver or exemption. The Kokole Point DOE launch site can accommodate a 381-m (1,2 -ft) ESQD arc (see figure 3.1.1. -1).

3.1.1.7.2.5 Area Clearance

Range Control is charged with surveillance, clearance, and real-time range safety. The Range Control Officer using PMRF assets is solely responsible for determining range status

and setting RED (no firing) and GREEN (range is clear and support units are ready to begin the event) range firing conditions. The Range Safety Approval and the Range Safety Operation Plan documents are required for all weapons systems using PMRF (U.S. Department of Defense, 1 1, Sep, p.3). PMRF uses RCC 321- , *Common Risk Criteria for* 1 8
National Test Ranges. RCC 321- sets requirements for minimally-acceptable risk criteria to occupational and non-occupational personnel, test facilities, and non-military assets during range operations. Under RCC 321- , individuals of the general public shall not be exposed to a probability of fatality greater than 1 in 1 million for any single mission and 1 in 1 million on an annual basis. (Range Commanders Council, 1 , February, p.3-)

Land Area Clearance

The Naval Air Warfare Center, Point Mugu, is responsible for establishing ground hazard areas and launch hazard areas (over water areas) beyond which no potentially hazardous debris from an early flight termination is expected to fall. The hazard area is determined by size and flight characteristics of the missile, individual flight profile of each exercise or flight test, and reaction time between recognition of a flight malfunction and the decision to terminate flight. Any failure of the missile system that would cause potentially hazardous debris to fall outside the ground hazard area would be detected by the Missile Flight Safety Officer who would terminate the missile flight before it could escape the hazard boundary. Data processed by ground-based or onboard missile computer systems may be used to recognize malfunctions and terminate missile flight. The Safety Officer monitors the flight continuously and always retains the capability to terminate the flight, if necessary. Figure 3.1.1. -1 shows the ground hazard areas associated with missile launch activities at PMRF. These ground hazard areas consist of Vandals at 1,82 m (, ft), Strategic Target Systems at a modified 3, 8 m (1 , ft), and smaller 2-m (2, -ft) and 1 -m (3, -ft) areas used for rail launch rockets.

To ensure the protection of all persons and property, safety procedures have been established and implemented for the ground hazard areas. These standard operating procedures include establishing road control points and clearing the area using vehicles and helicopters (if necessary). The road control points are established 3 hours prior to launch to allow security forces to monitor traffic as it passes through the ground hazard area. At 2 minutes prior to launch, the area is determined to be clear of the public to ensure that, in the unlikely event of early flight termination, no in uries or damage to persons or property would occur. After the Range Safety Officer declares the area safe, the security force gives the all-clear signal, and the public is allowed to reenter the area. (U.S. Army Space and Strategic Defense Command,
1 3, Oct, p.3-21) No inhabited structures are located within the off-base sections of the 13
ground hazard area. To further minimize the potential for launch associated hazards, PMRF has a Missile Accident Emergency Team assembled for all launches from KTF and on-call status for PMRF launches in accordance with PMRF Instruction 1 .1F.

Ocean Area Clearance

Range Safety officials ensure operational safety for pro ectiles, targets, missiles, and other hazardous operations into PMRF operational areas. The operational areas consist of two

Warning Areas (W-18   and W-188) and one Restricted Area (R-31 1) under the local control of PMRF. The Warning Areas are in international waters and are not restricted however, the surface area of the Warning Areas is listed as HOT (actively in use) 2   hours a day. For special operations, multi-participant or hazardous weekend firings, PMRF publishes dedicated warning Notices to Mariners and Notices to Airmen 1 week before hazardous operations. In addition, a 2 -hour recorded message is updated daily by Range Operations to inform the public when and where hazardous operations will take place.

The range safety clearance procedures at PMRF are some of the most rigorous because of the extra sensors available. Before an operation is allowed to proceed, the range is determined cleared using inputs from ship sensors, visual surveillance of the range from aircraft and range safety boats, radar data, and acoustic information from a comprehensive system of sensors and surveillance from shore. All missile impacts would be contained within predetermined hazard areas in the Temporary Operating Area by flight termination control for malfunctioning missiles or by containment based on performance capability for launch conditions for missiles without flight termination capability.

3.1.1.7.2.6 KTF Safety

Facility industrial safety at KTF is the responsibility of SNL for DOE all hazardous operations are performed under strict adherence to specific Standard Operating Procedures (SOP). A site SOP provides general requirements and guidance for all activities at KTF, including ordnance safety, pre-launch and hazardous operations control, ordnance handling and storage facilities, liquid fuels storage and handling, and launch pad operations.

Applicable SNL safe operating procedures are followed in con unction with applicable sections of DOE Explosives Safety Manual, DOE/EV/OG1   -3 DOD Explosives Safety Standards, and NAVSEA OP   , Volume 1, *Technical Manual for Ammunition and Explosive Ashore, Safety Regulations for Handling, Storage, Production, Renovation, and Shipping*. KTF notifies PMRF Operations, Security, Fire Department, and Ordnance/Explosive Disposal as required prior to launch and other hazardous operations. (U.S. Army Strategic Defense Command, 1   2, Feb,
p.3-   ) 13

KTF rocket motors and other ordnance components are stored in explosive storage magazines by PMRF, except when needed by KTF for processing, assembly, and launch. The movement of explosives and other hazardous materials between PMRF and KTF is conducted in accordance with PMRF procedures and in accordance with DOD Explosives Safety Standards.
(U.S. Army Strategic Defense Command, 1   2, Feb, p.3-   ) 13

At KTF, 2 8 L (gal) each of NTO and UDMH are stored for use in experimental payloads. The transportation, handling, and storage of these liquid fuels are conducted in accordance with DOT and DOD regulations and established procedures in place at KTF and PMRF. The use of these fuels at KTF is included within the PMRF spill response plan.

PMRF provides structural fire protection and fire fighting services to KTF, and promulgates and enforces base safety regulations and programs on KTF. (U.S. Army Strategic Defense Command, 1   2, Feb, p.3-   ) 13

3.1.1.7.2.7 Transportation Safety

PMRF transports ordnance (e.g., missiles) by truck from Nawiliwili Harbor to PMRF along Highway . The barges carrying explosives are met at Nawiliwili Harbor by trained ordnance personnel and special vehicles for transit to and delivery at PMRF. All ordnance is transported in accordance with DOT regulations. In addition, PMRF has established PMRFINST 8 23.G, which covers the handling and transportation of ammunition, explosives, and hazardous materials on the facility.

In addition, liquid fuels (e.g., NTO and UDMH) are transported to KTF. These fuels are shipped to the site by aircraft or barge, which do not affect transportation routes on the Island of Kauai, or by truck. Transportation of these materials is conducted in accordance with DOT regulations and specific safety procedures developed for the location. (U.S. Army Strategic Defense Command, 1 2, Feb, p. - through -) 13

3.1.1.7.2.8 Small Arms Firing Range

PMRF maintains an Outdoor Pistol Range, Building , with six firing points in the northwest portion of the station. In accordance with DOD standards, the range has a surface danger zone. The pistol range is currently inactive.

3.1.1.8 Land Use— PMRF/Main Base

This section provides an overview of the regional land use, land use plans, coastal zone management, and recreation resources on PMRF and the land ad acent to the facility. For a detailed discussion of the land use ad acent to the facility see section 3.1.2. , restrictive easement land use. Appendix E provides an overview of land title for DOD property addressed in this EIS.

3.1.1.8.1 Region of Influence

The region of influence for land use includes the main base complex and ad acent areas on the Mana Plain.

3.1.1.8.2 Affected Environment

3.1.1.8.2.1 Land Use

On-Base Land Use

PMRF s land use management program is established in the Master Plan, PACMISRANFAC HAWAREA, Barking Sands, Kauai, Hawaii (U.S. Department of the Navy, 1 , Oct, p.A-1 through JJ-1). The plan is intended to improve the effectiveness and efficiency of land use 1 and to minimize conflicts. The plan also addresses the need to protect essential mission activities from encroachment, and to protect the human and natural environments.

The dominant land use on PMRF, in terms of area, is the explosive safety and airfield clear zones, which cover 3 percent of the base (see figure 3.1.1. -1). Facilities located within these two zones include ordnance magazines, ordnance and weapons operating and support buildings, runways, taxiways, and support structures.

Operational areas are located throughout the base. The rocket launch (PMRF LC), DOE, and underground fuel storage areas are located to the north. In the central portion of the station is the Air Operations Area. Communication antenna fields are located to the south. Combined, the operational areas total approximately 13 ha (33 ac).

Supply and maintenance areas are located ad acent to the flightline in the main base and also ad acent to the operation area in the northern portion of the base. Administration and personnel support areas are located in the main station and the southern portions, respectively. These areas provide space for family housing, administration, bachelor housing, utilities, exchange retail, and recreation facilities (see figures 3.1-2 through 3.1-).

According to the State Land Use Classification, PMRF/Main Base is located within a conservation district. Conservation districts are managed by the Hawaii DLNR. However, as PMRF/Main Base is a Federal facility, State and local land laws are preempted. The dune area from Nohili Point to the north boundary of PMRF/Main Base has been designated as a scenic ecological area by Kauai County.

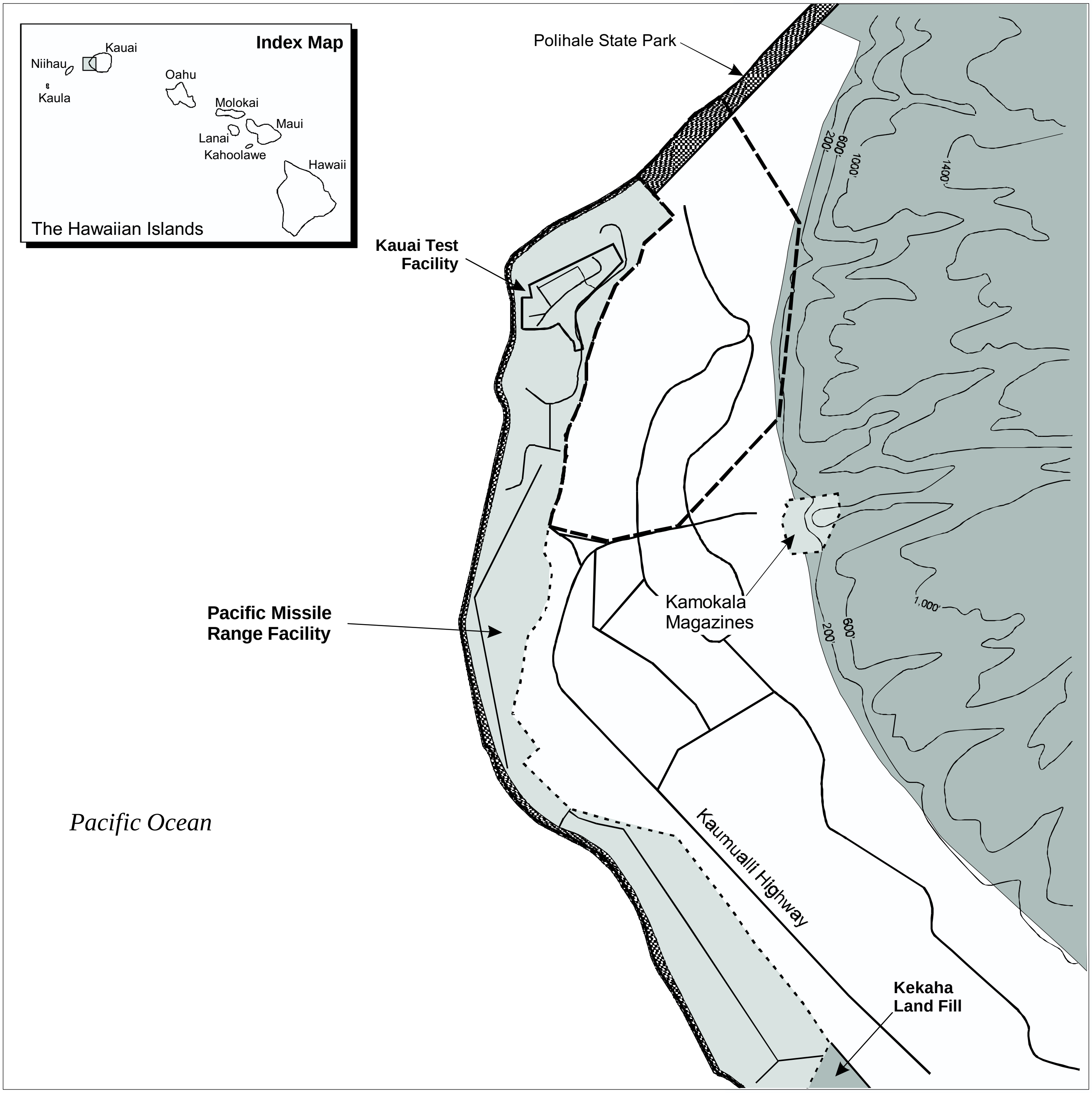
PMRF has an AICU study. The agriculture, recreation, and open uses ad acent to PMRF were determined to be within acceptable AICU guidelines. None of the clear zones or accident potential zones include off-base land. Several facilities on PMRF are not compatible with AICU recommendations however, PMRF has obtained waivers for these facilities.

Off-Base Land Use

The general land uses ad acent to PMRF include recreation to the north (Polihale State Park), agriculture to the east (sugar cane), the Pacific Ocean which is used for Naval training activities and recreational uses to the west, and a 2 . -ha (3-ac) landfill (Kekaha Land Fill) to the south (figure 3.1.1.8-1). The State of Hawaii has classified the lands to the north and south of the station as conservation lands and the land to the east as agriculture (figure 3.1.1.8-2). The agricultural land to the east is owned by the State and leased to Amfac Sugar-Kauai (11,22 ha 2 , 2 ac) for the production of sugar cane.

The Kauai General Plan was established to guide the planned growth of the county. As a refinement of the county General Plan, the Waimea-Kekaha Regional Development Plan (Ordinance No. 32) has retained and expanded the goals of the General Plan. The ob ective of the Waimea-Kekaha Regional Development Plan is to implement, by establishment of development plans, general land use maps, zoning maps, and design criteria, the intent and purpose of the adopted Kauai General Plan and to amend certain portions of that plan to recognize more detailed information and more precise community goals and ob ectives. (Belt Collins Associates, 1 , Sep, p.1)

The Waimea-Kekaha Regional Plan and Kauai General Plan zoned the land ad acent to PMRF as open and agricultural (figure 3.1.1.8-3). The land occupied by Polihale State Park is designated by the State as conservation and is outside the zoning urisdiction of the county. The regional development plan also shows three pro ect areas ad acent to PMRF: the North Gate site (22 ha ac) South Gate site (ha 183 ac) and the 1 ha (38



EXPLANATION

Military

Agriculture (Sugar Cane)

Agriculture and Open

Recreation

Pacific Missile Range Facility Boundary

Restrictive Easement Boundary

2 Contour Lines (ft)

Scale

2 1, Meters

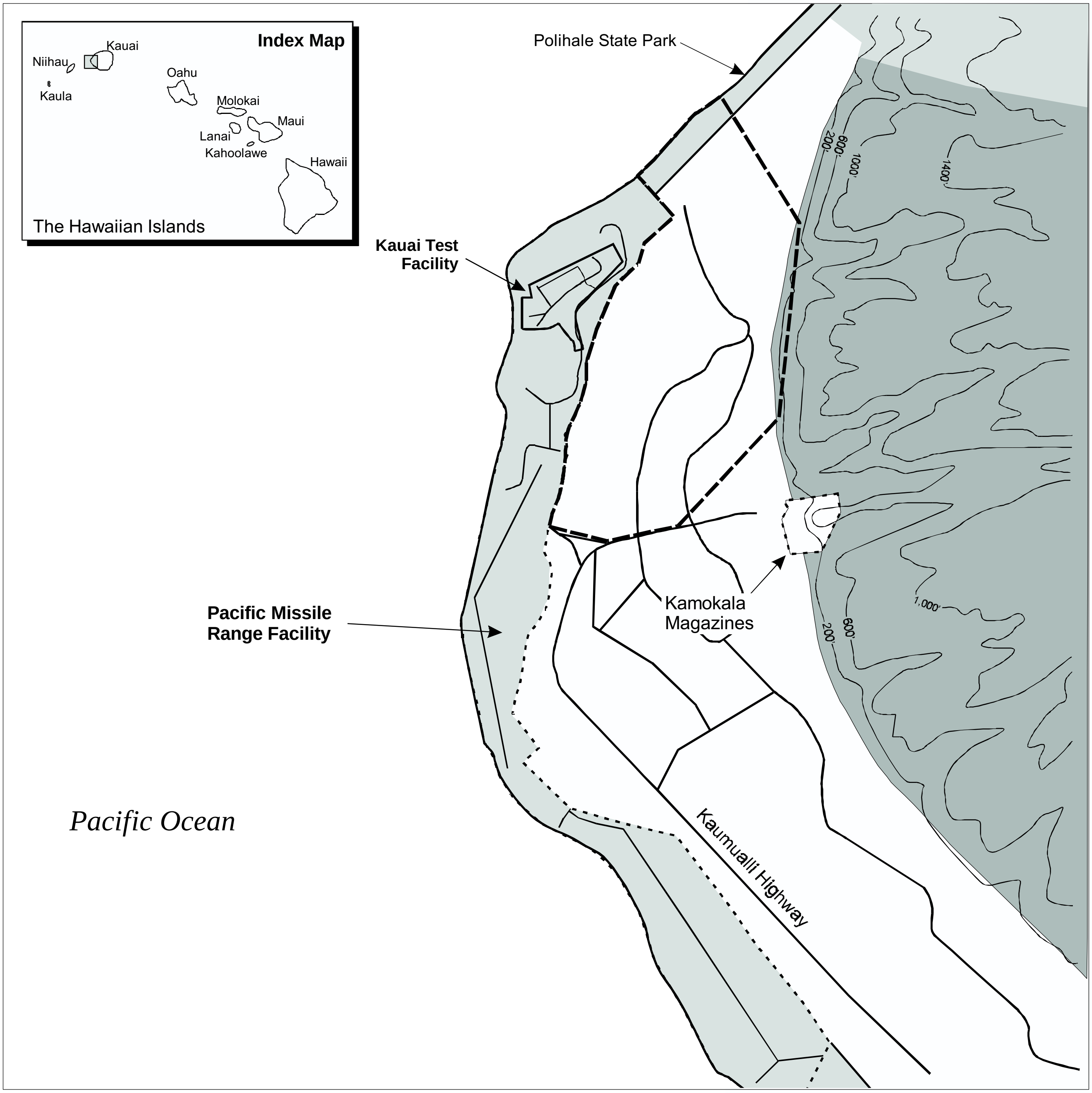
2,3 , Feet

NORTH

Land Use on the Mana Plain (Revised)

Kauai, Hawaii

Figure 3.1.1.8-1



EXPLANATION

Conservation (State Designation)

Agriculture

Agriculture and Hawaiian Home Lands

Pacific Missile Range Facility Boundary

Restrictive Easement Boundary

200 Contour Lines (ft)

NORTH

Scale

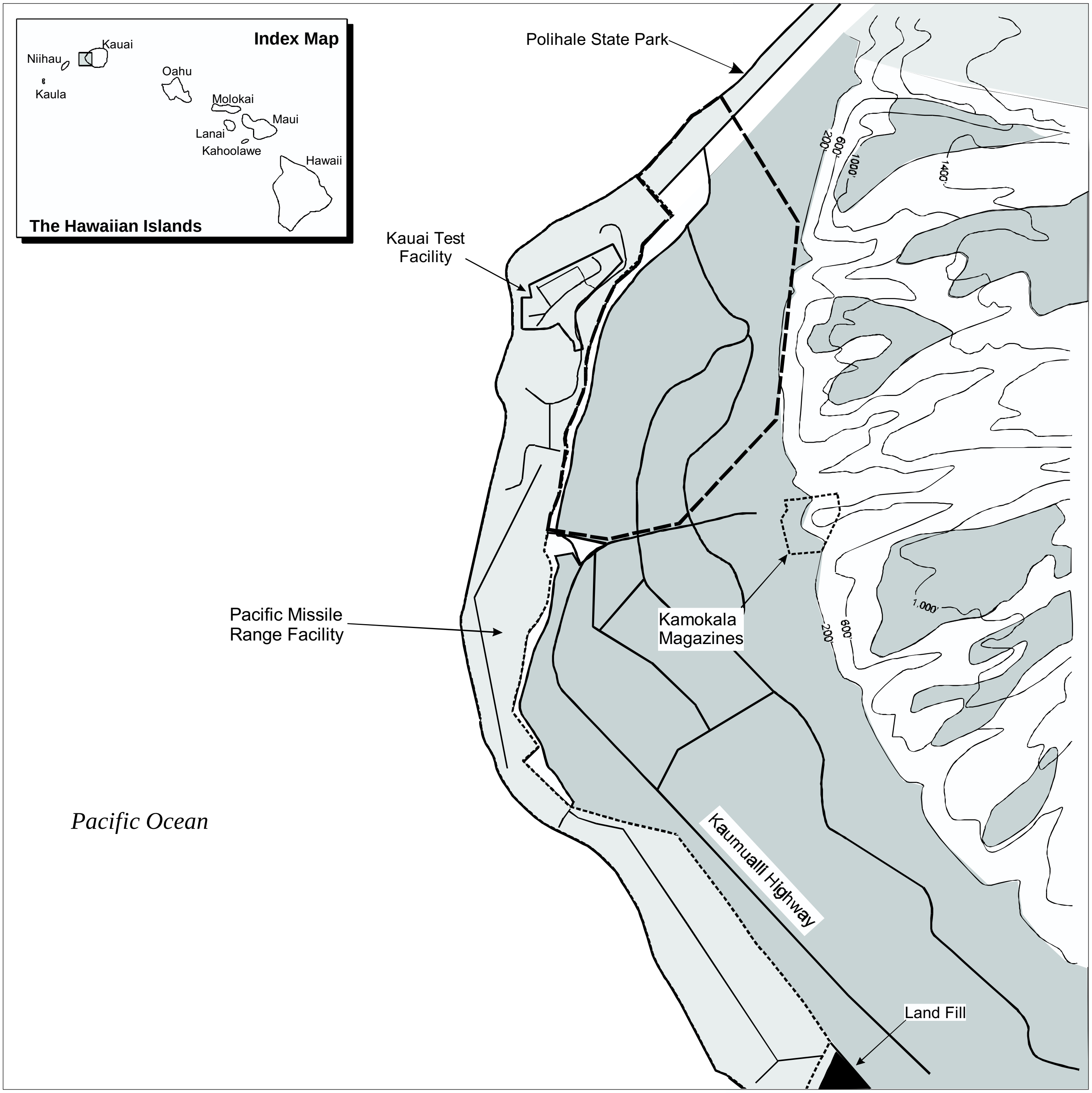
2 1, Meters

2,3 , Feet

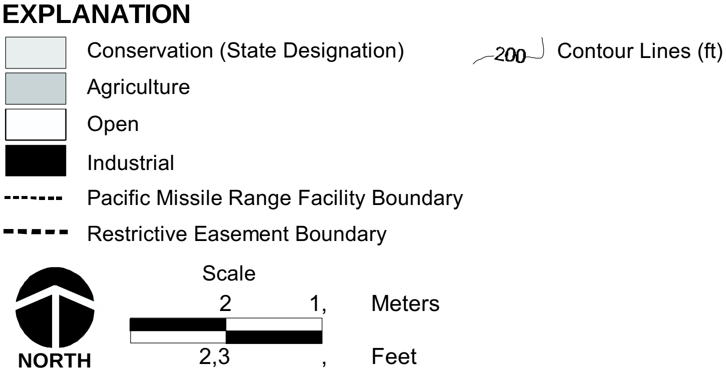
State Land Use Designations on the Mana Plain (Revised)

Kauai, Hawaii

Figure 3.1.1.8-2



EXPLANATION



County Land Use Designations on the Mana Plain (Revised)

Kauai, Hawaii

Figure 3.1.1.8-3

pmrf lu 3

ac) between PMRF and Kekaha. This land is intended for industrial uses complimentary to PMRF activities. (Belt Collins Associates, 1 , Sep, p.1 through 11)

As part of the Coastal one Management Act Program, the County of Kauai has established guidelines for the review of developments proposed for special management areas (figure 3.1.1.8-). A small area ust east of PMRF North Gate and Polihale State Park has been designated as a special management area. Any development in these areas requires a special management use permit.

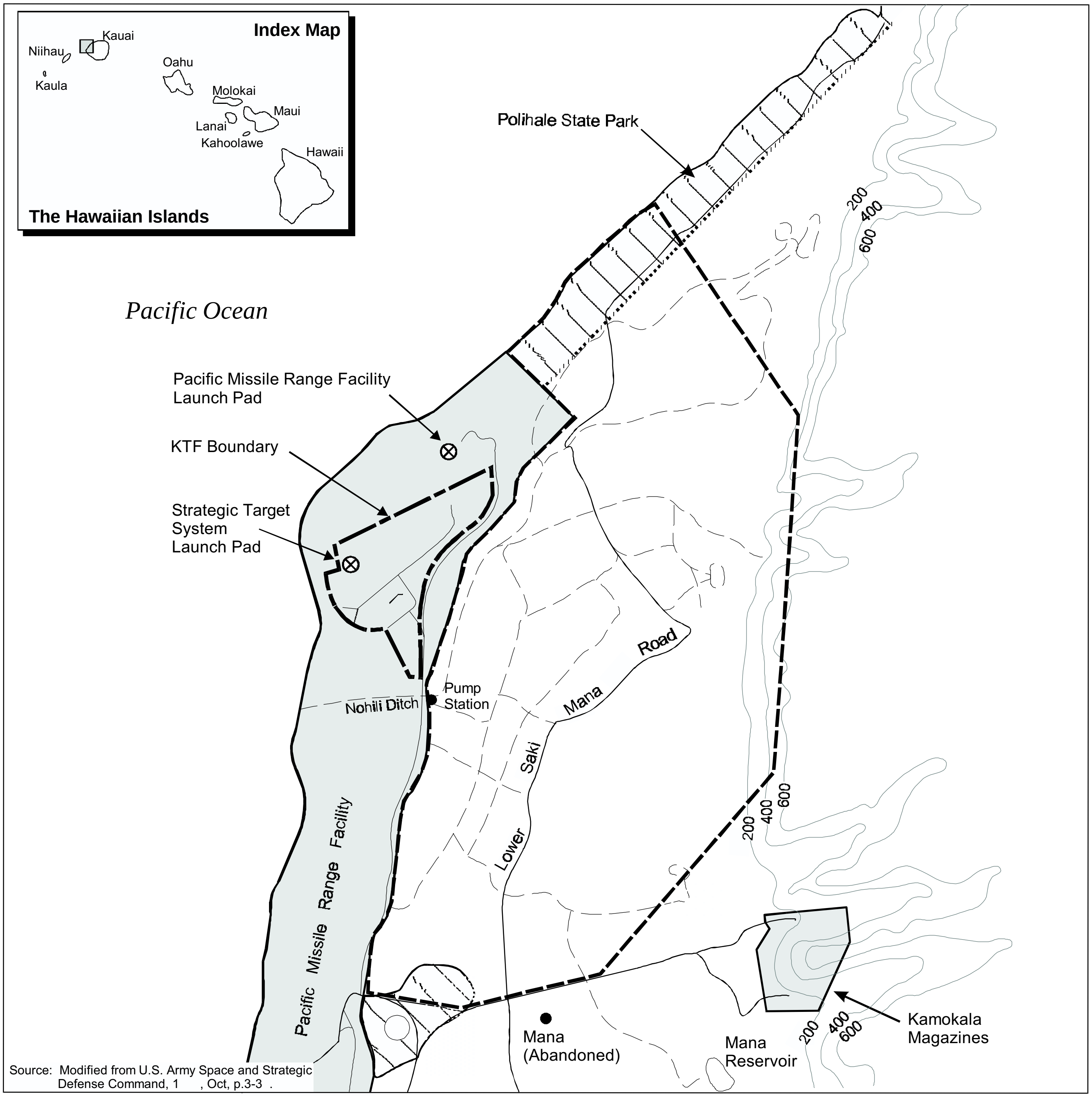
Off-base land use affected by PMRF operations include those within the ESQD arcs, EMR areas, aircraft noise contours, and missile ground hazard areas. ESQD arcs that extend beyond the PMRF boundary include four ESQD arcs in the northern area and one in the central portion of the base. The off-base land use within these areas has been designated by both the county and State as agricultural areas. Missile ground hazard areas which are only used during launch events that extend off-base occur in northern PMRF and encompass agricultural and recreational uses (Polihale State Park). This area includes 11,22 ha (2 , 2 ac) of State-owned land leased to Amfac Sugar-Kauai for the production of sugar cane and 28 ha (ac) of Polihale State Park, which provides overnight camping (no campgrounds are within the ground hazard area) and day use recreational activities. The State has designated these areas as agricultural and conservation and the county as agricultural. The use of the ground hazard areas is included within a restrictive easement that was established between the U.S. Government, State of Hawaii, and Amfac Sugar-Kauai under a Memorandum of Agreement. This Memorandum of Agreement, which expires on 31 December 2 2, allows PMRF to clear the area for Vandal and Strategic Target System launches for up to 3 launches per year.

A small area of the day-night average sound level (L_{dn}) - dBA noise contour from aircraft operations extends off-base in the central portion of PMRF. The land use in this area is agricultural and has been designated by the State and county as agriculture. This area is considered a compatible use under Navy AICU guidelines of L_{dn} -8 dBA for agricultural areas without buildings (U.S. Department of the Navy, 1 , Oct, p.EE-2). No buildings exist 1
within any of the above off-base areas.

3.1.1.8.2.2 Recreation

On-Base Recreation

To facilitate public access on PMRF, the coastline (approximately 3 m 1, ft wide and 13 km 8 mi long) has been divided into three recreational areas, designated recreation areas 1, 2, and 3 (figure 3.1.1.8-). Except when closed for hazardous operations, recreation area 1 is open Monday through Friday from : p.m. to : a.m., recreation area 2 is open from : p.m. to : a.m., and recreation area 3 is open 2 hours a day. All three recreation areas are open 2 hours a day on weekends and holidays. Additional closure times occasionally occur when hazardous operations are being conducted (table 3.1.1.8-1). However, most PMRF operations take place during the times these areas are normally closed (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.33 through 3). To inform 13
the public of when specific recreation areas on



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EXPLANATION

- Irrigation Drainage Ditch
- Kauai Test Facility
- Polihale State Park Boundary
- Restrictive Easement Boundary
- Pacific Missile Range Facility
- Special Management Area
- State Highway
- 200 Contour Lines (ft)
- KTF Kauai Test Facility

Scale

1 Meters

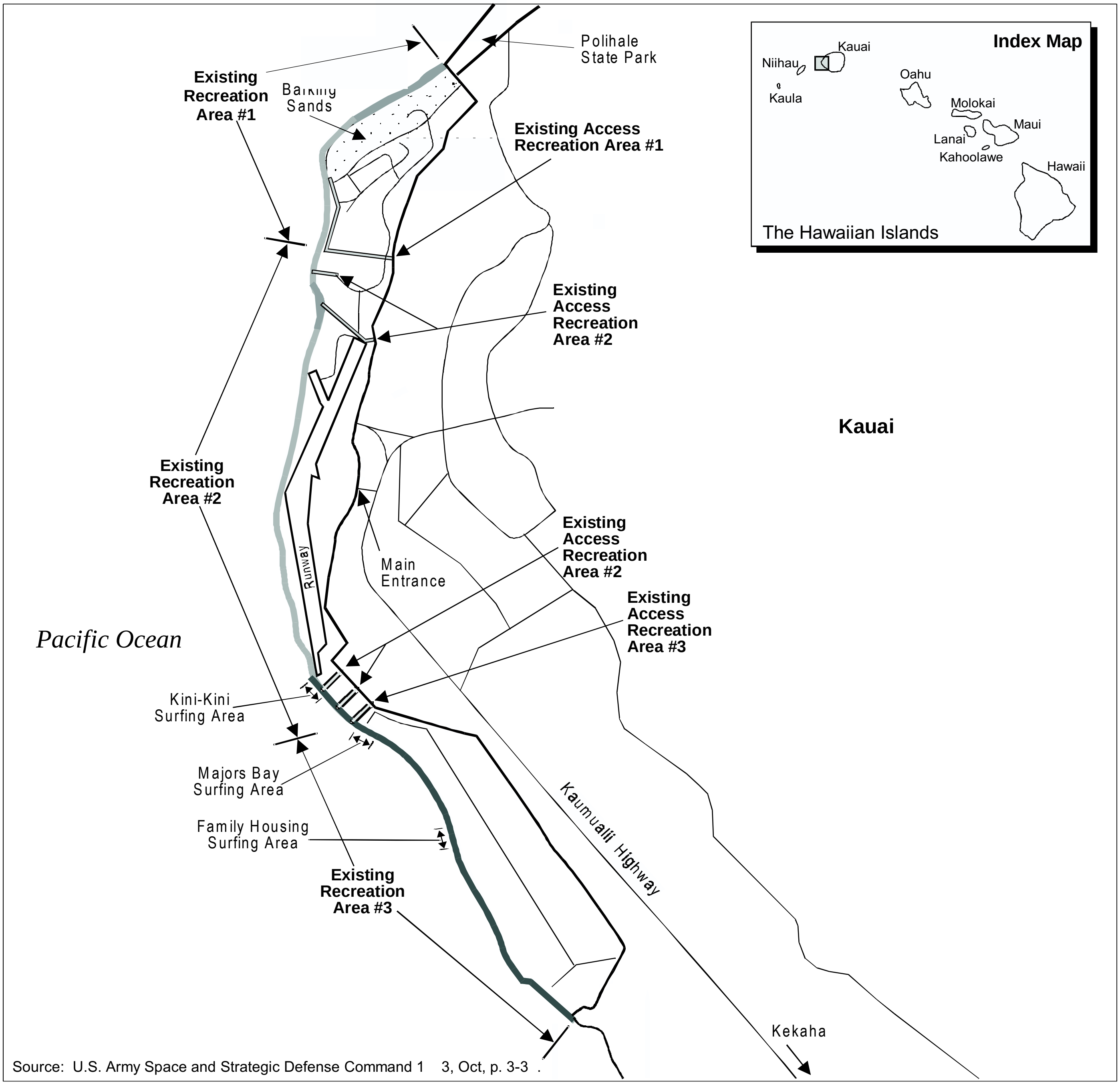
1, 3, Feet

NORTH

Kauai County Special Management Areas (Revised)

Kauai, Hawaii

Figure 3.1.1.8-4



Source: U.S. Army Space and Strategic Defense Command 1 3, Oct, p. 3-3 .

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EXPLANATION

Sand Dune

Rocky Beach

Sandy Beach

Beach Access

Pacific Missile Range
Facility Boundary

Scale

1, 8 Meters

2, , 8 Feet

NORTH

Pacific Missile Range Facility Recreational Areas

Kauai, Hawaii

Figure 3.1.1.8-5

and ad acent to PMRF will be closed, Range Operations maintains a 2 -hour hotline which is updated daily that provides specific information on each recreational area as well as the ocean in front of the base. This hotline was established to assist the public in planning their activities at PMRF.

Table 3.1.1.8-1: Availability of Beaches on PMRF

Recreation Area	Posted Available Hours	Additional Closure Hours	Total Available Hours
1	,1	1, 2	, 8
2	, 28		, 28
3	8,	2	8, 88

Recreation area 3 was requested most frequently (2 percent of the time), followed by recreation area 1 (11 percent) and recreation area 2 (percent). The most popular activities at these recreation areas are surfing (1 percent), fishing (3 percent), and general beach activities (1 percent) (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3). 13

On-base recreation services open to military and civilian personnel include an auto hobby shop, a craft center, a 2 -seat outdoor movie theater, a recreation center, a wood hobby shop, and a racquetball/handball court. Outdoor recreational facilities include three tennis courts, a lighted golf driving range, a lighted softball field, a lighted multi-purpose playing court, a year-round swimming pool, and an 18-hole miniature golf course (U.S. Department of Defense, 1 1, Sep, p.13 through 1) 1 8

Off-Base Recreation

The only off-base recreation area in the region of influence is Polihale State Park. This park is used for swimming, shore fishing, native Hawaiian subsistence fishing, picnicking, tent camping, and trailer camping. For a detailed description of the State Park see section 3.1.2. .

3.1.1.9 Noise— PMRF/Main Base

Characteristics of sound include amplitude, frequency, and duration. In environmental noise assessments, sound pressure (energy) is the parameter usually measured it is denoted in terms of decibels (dB). Due to the extremely large range of measurable sound pressures, the dB is expressed in a logarithmic scale. This permits calculations that allow for large variations in sound pressure, while maintaining a manageable scale of measurement.

As noted above, the dB is the accepted standard unit of measure for sound pressure level (SPL). Since there is no absolute lower limit of sound, dBs are calculated using a reference acoustic pressure. The calculation follows this formula:

$$dB = 10 \times \log_{10}(p^2 / p_{ref}^2),$$

where dB is the measured SPL p is the measured acoustic pressure and p_{ref} is the threshold of human hearing ($2\times1^{-}$ N/m^2). This results in a measure of   dB at the threshold of human hearing.

The human ear is not equally sensitive to all frequencies throughout the spectrum. Sound levels ad usted for frequency-dependent amplitude (as established by the American National Standards Institute) are called weighted sound levels. Weighted measurements emphasizing frequencies within human sensitivity are called A-weighted (dBA) typical A-weighted sound levels are displayed in figure 3.1.1. -1. When high-intensity impulsive sound is evaluated to determine its effects on human populations, C-weighted sound levels are used this applies weighting to low-frequency effects. These effects include windows rattling and vibrations that influence people s perceptions of a sound.

Noise is usually defined as undesirable sound, because it interferes with verbal communication and hearing, can cause hearing loss, or is otherwise annoying. Since noise levels vary with time, several descriptors have been developed comparing these variations over different time periods. The most commonly used descriptor in environmental reports is the L_{dn}. The L_{dn} is the weighted average sound level for a 2 -hour period (with a 1   dB penalty factor for all sound from 1 :   p.m. until   :   a.m.). The ma or shortcoming of the L_{dn} is that the 2 -hour averaging tends to obscure high-noise, short-term events (such as missile launches). In these cases, the maximum sound level (L_{max}) is required. Used predominately to gauge high noises of short duration, it measures the greatest level occurring during a single noise event.

3.1.1.9.1 Region of Influence

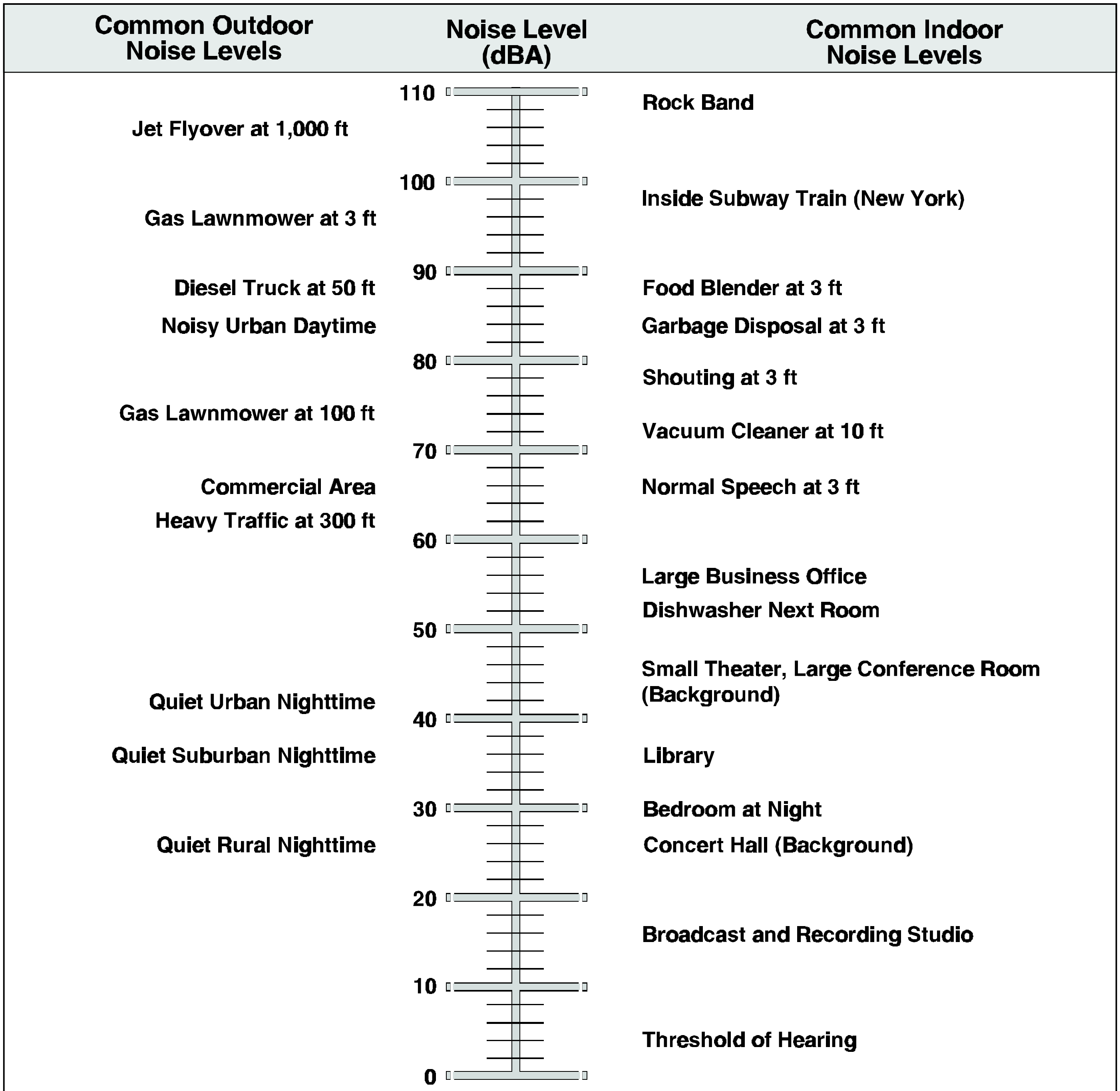
The region of influence for noise includes those areas potentially affected by operations that generate noise on PMRF. This would include all areas on the Mana Plain (PMRF, Polihale State Park, and sugar cane fields) and the city of Kekaha.

3.1.1.9.2 Affected Environment

Current sources of noise on PMRF/Main Base include airfield operations (high-performance aircraft, cargo/passenger aircraft, helicopter operations), base operations (including exercise support), and missile, rocket, and drone launches.

Noise levels near the runway may average as high as L_{dn} dBA. Buildings in this area are insulated to achieve a noise reduction of up to 3   dBA. Noise levels farther away from the runway are more characteristic of a commercial park, with levels not exceeding L_{dn} dBA.

Airfield activities have a more-or-less continuous impact on the base s sound environment. These impacts are presented in the PMRF/Main Base AICU . Base operations that may impact the sound environment include, but are not limited to, power generation, exercise support, maintenance operations, and construction or renovation. The activity with the most noticeable sound events is the launch of missiles, rockets, and drones. These launch operations result in high-intensity, short-duration sound events. Typical rockets launched include the Strategic Target System, STR PI,   EST, and Vandal from northern PMRF and Terrier and Nike missiles from southern PMRF. Past launches of these systems have resulted in no public noise complaints.



Source: U.S. Army Space and Strategic Defense Command, 1994.

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EXPLANATION

dBA A-weighted Decibel(s)

Comparative Sound Levels (Revised)

Figure 3.1.1.9-1

Noise associated with missile launches for the EST program, which uses the same Talos booster as the Navy Vandal, and the Strategic Target System were monitored during past launches from northern PMRF. Table 3.1.1. -1 shows noise levels monitored for the EST program and the Strategic Target System. (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-2) 13

Noise generated from the Strategic Target System has been infrequent, with only four launches occurring since 1 3. Vandal launches have averaged eight per year over the last years. Launches from southern PMRF include the Terrier and Nike. Table 3.1.1. -2 provides modeling estimates of expected noise levels of the Terrier and Nike which average from none to up to six per year. (Sandia National Laboratories, 1 2, Jul, p.8). ~~Number of launches from this location average from none to up to six per year.~~ 8

Table 3.1.1.9–1: Sound Analyzer Data of September 1991 ZEST Launches and February 1993 Strategic Target System Launch

Launch Vehicle	Distance m (ft)	Measured Average Peak (dB)
EST		
2 September 1 1	221 (2)	12 .8
	3 .8 (1,)	122.
	38 (1,2 3)	11 .
	2 . (1,)	11 .
	.8 (2,)	11 .
11 September 1 1	221 (2)	12 .
	3 .8 (1,)	121.
	38 (1,2 3)	118.2
	2 . (1,)	12 .2
	.8 (2,)	1 .
Strategic Target System		
2 February 1 3	1 .3 ( )	12 .3
	2 3.8 (8)	123.
	2 8. (881)	121.8
	3 2. (1,222)	118.2
	82.8 (1, 8)	11 .3
	3, 8 (1 ,)	.1
	1 , 8 (3 ,)	.

Source: U.S. Army Strategic Defense Command, 1 2, Feb, p.3-2 . 139

Table 3.1.1.9–2: Predicted Maximum Sound Levels for Rocket Systems Launched from Kokole Point (Southern PMRF)

	Maximum Sound Levels (dBA)	
Distance (m/ft)	Terrier	Nike
1/2	138	13
182. /	128	12
381/1,2	121	118
. /2,	11	113
1, .8/3,3	111	1
3,3 2.8/11,		1
8, 8.2/28,8		
1 ,82 . /3 ,		1

Source: Sandia National Laboratories, 1 2, Jul, p.8 . 98

The nearest on-base housing area is located approximately 8 km (mi) south of KTF, 1. km (1 mi) from the southern launch sites. The nearest off-base residential area is Kekaha, which is approximately 13 km (8 mi) south of the northern launch areas and 3.2 km (2 mi) from the southern launch sites. (U.S. Program Executive Office, 1 , May, p.3-1 , 3-1) The effects 212 of launch noise in Kekaha during monitoring conducted for the Strategic Target System launches were approximately dBA (near ambient background levels for this location). Infrequent launches from southern PMRF generate noise levels of between 82 dBA and 2 dBA in the city of Kekaha. The residential areas and schools in Kekaha are the only sensitive receptors in the PMRF noise region of influence.

3.1.1.10 Socioeconomics— PMRF/Main Base

Socioeconomics describes the social and economic characteristics of a community by isolating and analyzing several variables including population size, employment characteristics, income generated, and the type and cost of housing. This section presents a socioeconomic overview of the region.

3.1.1.10.1 Region of Influence

The region of influence for socioeconomic analysis is Kauai, which includes 11 inhabited census tracts.

3.1.1.10.2 Affected Environment

The socioeconomic character of Kauai was discussed in detail in the Restrictive Easement EIS (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-22 through 3-32). Much 13 of the discussion centered on the impact of Hurricane Iniki in 1 2, and emphasized that, in 1 3, it was difficult to predict the rate at which Kauai would recover from the losses incurred. The analysis of the affected environment builds on the findings of the Restrictive Easement EIS therefore, it highlights changes since 1 2.

3.1.1.10.2.1 Population and Income

In 1 , the population of Kauai County was 1,1 . The 1 Bureau of Census Counties Profile estimates that the population for the county rose to ,131 in 1 (equal to . percent of the population of Hawaii), a change of almost . percent over the -year period. Table 3.1.1.1 -1 shows the ethnic origins of the population of Kauai in 1 . Table 3.1.1.1 -2 illustrates the age profile of those living in Kauai County in 1 .

Table 3.1.1.10–1: Ethnic Origins of the Population of Kauai in 1990

Persons		**51,177**
	Male	2 , 11
	Female	2 ,2
Race	Asian	2 ,
	White	1 , 2
	Hawaiian	,
	Pacific Islander	338
	Other	1, 88
Households		**16,326**
Families		**12,502**

Source: U.S. Counties 1 , U.S. Census Bureau. 142

Table 3.1.1.10–2: Age Profile of Kauai County Residents in 1990

	Kauai County		Hawaii	
Age group (years)	**Population**	**Percentage**	**Population**	**Percentage**
1 and younger	13,	2 .	2 , 1	2 .
1 -2	,	8.	131,8 2	11.
2 -3	12,	2 .2	3 , 8	2 .1
-	13, 1	2 .2	28 ,	2 .
and over	, 2	13.1	12 ,	11.3

Source: U.S. Counties 1 , U.S. Census Bureau. 142

Prior to Hurricane Iniki, Kauai s population had been pro ected to grow from 2, (in 1) to , by the year 2 . Latest pro ections (May 1) show that the population of Kauai County was estimated to be ,131 in 1 and will grow to , by 2 . It was estimated in 1 3 (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-2), that 8, to 13
1 , of Kauai s population had emigrated to flee the effects of the hurricane. Though latest data shows that the population of Kauai is growing once more, previous estimates for the year 2 are unlikely to be equaled.

Personal income in Kauai was estimated by the Bureau of Economic analysis to amount to 1. billion in 1 3. This represented percent of the total personal income of Hawaii. The average per capita income in Kauai County, in the same year, was 1 ,13 , while the average per capita income of Hawaii as a whole was 23, , or 22 percent greater.

3.1.1.10.2.2 Housing

In 1 3, housing was characterized as overcrowded, costly, and in short supply. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-2). Hurricane Iniki compounded 13
these problems for a period, though its main effect was to depress the local economy and, in particular, the real estate market. Current housing supply in Kauai appears to be greater than demand due to the economic downturn, with high-end real estate values having fallen in recent years. The number of owner occupied homes has grown from 8, 2 in 1 , to , 1 in 1 (Kauai Data Book, 1 , p.2). This represents an increase in the stock of owner occupied homes of 2 percent, compared to an 8 percent growth in the State as a whole. The value of aggregate property sales in 1 was percent less than in 1 . Though improving slowly, the outlook for real estate in Kauai remains uncertain, with few property developers on the island willing to add new homes to the existing stock.

3.1.1.10.2.3 Employment

Table 3.1.1.1 -3 shows the number of individuals employed within the main sectors of the economy of Kauai and within Hawaii as a whole. Retail and service industries dominate both profiles, employing more than percent of the workforce at county and State levels.

Table 3.1.1.10–3: Employment in Kauai and Hawaii

Employment Sector	Kauai		Hawaii	
	Number of Employees	Percent of Total	Number of Employees	Percent of Total
Agriculture, forestry and fishing	1 1	.	2,821	.
Construction	1,	.8	2 ,81	.
Manufacturing	3	.8	18,313	.
Transportation and public utilities	1, 2	.1	1,13	.
Wholesale trade	3	3.3	22, 1	.
Retail trade	,	28.	1 8,8	2 .
Finance insurance and real estate	1,3 3	.8	3 ,811	.3
Services	, (est.)	3 .2	1 ,	38.
Total (exc. mining)	**19,151 (est.)**	**100**	**425,987**	**100**

Source: U.S. Counties 1 , U.S. Census Bureau. 142

Tourism, tourism-related services, and government have continued to be the main employment generators since the 1 2 hurricane. Currently, the three largest employers on Kauai are the County of Kauai, PMRF, and Wilcox Health Systems.

The number of people recorded as unemployed on Kauai rose rapidly during 1 2, the year of Hurricane Iniki in 1 1, 1,2 were recorded as unemployed, while in the following year this number rose to 3, . Unemployment peaked in 1 , when it reached ,1 persons (1 .2 percent). In 1 , unemployment fell to 3,2 persons (11. percent). It currently stands at 11. percent (State of Hawaii, URL http://www.hawaii.gov/workforce/lfkc8 .txt, 1 8). 1

3.1.1.10.2.4 Agriculture

Although the number of farms on Kauai has increased from 3 in 1 8 , to in 1 , farm acreage has declined by about 1 percent over the same period. The number of self-employed farm operators and their unpaid family members stood at 2 persons in 1 . These operators and others employed 1, hired workers on Kauai. (State of Hawaii, 1) 211

In 1 , over 28 percent of Hawaii s sugar cane acreage was located in the five sugar cane plantations of Kauai County. These plantations produced, in the same year, 1.1 billion kg (1,1 8, tons) of unprocessed cane, or 21 percent of Hawaii s tonnage. Kauai s unprocessed sugar cane was valued in 1 at 3 .2 million, or 22 percent of Hawaii s total sugar cane value (State of Hawaii, 1). By early 1 8 the number of plantations had 211
been reduced to two. Kauai has been pursuing a policy of agricultural diversification, which includes the production of coffee, seed corn, vegetables and melons, fruits, macadamia nuts, taro, field crops, and flowers and nursery products. These crops occupied in 1 less than 1, 11.8 ha (2, ac) of Kauai, compared to the 13, 2.1 ha (3 , ac) devoted to sugar cane. They generated approximately 12 million of revenue in 1 , or roughly 1, 2. per ha (,8 per ac) cultivated. This compared to a product of 1, 2 per ac of cultivated sugar cane in the same year.

Livestock production was valued at . million in 1 , over percent of which comprised cattle and hog sales.

3.1.1.10.2.5 Tourism

It is estimated that over 1 , people are employed in tourism and travel in the State of Hawaii. This represents over 31 percent of the workforce. (World Travel Tourism Council, 1 , Aug, p.1) Kauai s share of the Hawaii visitor market was 13. percent in 1 . This 183
represents a strong recovery from 1 2, when the impact of Hurricane Iniki reduced Kauai s share to 3 percent. Estimated visitor expenditure in 1 3 was million, a substantial fall from the 1 1 total of 1.1 billion.

The accommodation inventory for Kauai rose percent between 1 3 and 1 , with 1 8 properties providing , rooms. Although not reaching the capacity of 1 2, when there were , 8 rooms available, the 1 figure represents a strong recovery from the , 31 rooms available in the 1 3 season, immediately after Hurricane Iniki. The most important contribution to this post-hurricane recovery was the reopening of the Kauai Marriott with 8 rooms.

The numbers of visitors to Kauai from 1 1 through 1 are shown in table 3.1.1.1 - .

Table 3.1.1.10–4: Visitors to Kauai (1991-1995)

Year	Kauai	Hawaii	Kauai as a % of State
1 1	1,2 , 2	,8 3,8	18.
1 2	8 ,	, 13,88	13.
1 3	1,	,12 ,23	.3
1	8 3,8	, 3 ,3	13.
1	1 ,	, 8 ,13	13.

Source: Hawaii Visitor Bureau, Visitor Statistics, 1 . 192

3.1.1.10.2.6 Pacific Missile Range Facility

PMRF is the largest Federal government employer on Kauai. In September 1 , it employed a total of 8 personnel. Of those, 2 worked directly for PMRF, while the remaining were employed by tenant organizations and subcontractors. The PMRF workforce is composed of 183 DOD civilian personnel, 1 military personnel, contractor personnel, and 1 3 tenants. There were also a large number of official visitors to PMRF, accounting for approximately 1 , visitor days in 1 - (table 3.1.1.1 -).

Table 3.1.1.10-5: No-action Alternative Employment and Population

	Military Personnel	Civilian, Contractor, and Tenant Personnel
Workers	1	3
Workers Residing on PMRF		
Workers Residing Off-Station	1	3
Average Daily Visitors		3

Approximately 3 Navy personnel and 1 2 dependents were residing in the on-base housing units. In addition, approximately 1 military personnel working at PMRF resided in off-station housing. Under the No-action Alternative, it is expected that this level would remain the same throughout the analysis period.

PMRF has an annual average daily temporary duty count of 3 personnel supporting mission activities. The actual peak temporary duty population could be higher than this average. Most of these personnel stay in off-station locations.

The direct economic impact on Hawaii of PMRF, its tenant organizations, contractors and visitors, was 11 . million in 1 . The PMRF operating budget in 1 was 1 million, of which million was payroll.

PMRF expenditures in 1 included 8.2 million for construction pro ects throughout the Hawaiian Islands and million for other purchases. Visitors to PMRF were estimated to have spent . million in the Kauai economy in 1 .

3.1.1.11 Transportation— PMRF/Main Base

The purpose of the transportation section is to address the road and water (if applicable) transport system and its use within a region of influence defined for each location. For this document, the primary category encompassed under the term transportation is the system of streets and highways within the region of influence and their use by vehicles.

3.1.1.11.1 Region of Influence

The region of influence for transportation includes those systems of roads within or immediately ad acent to PMRF.

3.1.1.11.2 Affected Environment

Imiloa Road is a two-lane roadway with a posted speed of 2 mi per hour that provides direct access to PMRF/Main Base from State Highway (Kaumualii Highway). It intersects Kaumualii Highway, which is a primary circulation route connecting PMRF/Main Base with Kekaha and Lihue (figure 3.1-1). Kaumualii Highway, in the vicinity of Imiloa Road, is a two-lane road with a posted speed limit of mi per hour. (U.S. Army Program Executive Office, 1 , May, p.3-1) 12

State Highway and Kao Road provide access to PMRF from the southwest. According to a 1 DOT traffic summary for the Island of Kauai, the average daily traffic from Akialoa Road, 1 km (.3 mi) south of Kao Road along Route , and Kao Road was 2, 1 vehicles.

3.1.1.12 Utilities— PMRF/Main Base

Utilities elements include facilities and systems that provide potable water supply, wastewater treatment, solid waste disposal, electrical supply, and propane.

3.1.1.12.1 Region of Influence

The region of influence for infrastructure includes those systems within or immediately ad acent to the Main Base complex.

3.1.1.12.2 Affected Environment

The PMRF Public Works Office maintains base facilities and oversees the facility s environmental program. Ongoing operations and maintenance activities involve potable water supply, wastewater treatment, solid waste disposal, electrical supply, and propane gas supply.

3.1.1.12.2.1 Electrical Supply

Kauai Electric Company provides commercial power to PMRF on Kauai. Power to the main base and northern complex area is supplied at 12. kilovolts (kV) from Kauai Electric Company s Mana substation. The power is reduced to .1 kV for distribution on-station by a 1, -kilovolt ampere (kVA) transformer which serves the Operations Building Area, and by a bank of three 1 -kVA transformers which serve the remainder of the base. The present peak power load of the northern complex area is 1, kVA. (U.S. Department of the Navy, 1 , Oct, p.D- 1) 1

The .1 -kV feeder from the 1, -kVA transformer connects to switches in the main PMRF power plant, which serves as backup to the Kauai Electric Company system. The power plant contains two -kW and three 3 -kW generator units. Primary power to the southern area of the base is supplied by a 12. -kV feed system from Kauai Electric. (U.S. Department of the Navy, 1 , Oct, p.D- 1) 1

Kauai Electric Company typically averages or more power outages a year. Due to this unreliability, Range Operations receives electricity from the PMRF power plant, with commercial power used as a backup. (U.S. Department of the Navy, 1 , Oct, p.D- 1) 1

3.1.1.12.2.2 Solid Waste Disposal

PMRF disposed of 1.1 million kg (1,1 tons) of refuse in the Kekaha landfill from 1 October 1 to 3 September 1 (Pacific Missile Range Facility, 1 , 3 Aug, p.A-1). The PMRF 2
operations and maintenance contractor collects this refuse and delivers it to the county-operated sanitary landfill at Kekaha, which is the only operating landfill on Kauai. Current life expectancy of the landfill is until 1 8. (Inouye, 1 , 1 Dec, p.1) The county is looking into 1 1
acquiring additional lands from the State to meet future refuse requirements, and/or is seeking variants to increase the height of the landfill.

PMRF has a recycling program for aluminum cans, glass, and paper. Collection points are widely distributed at PMRF/Main Base facilities, and items are collected twice a week. The aluminum cans are sold a nominal fee is paid to a commercial collector for the glass items and the paper is placed in regular recycled-paper dumpsters for collection by a commercial vendor (Tottori, 1 , 1 Mar, p.1). Green waste is collected and chipped for compost and 122
use on the base.

3.1.1.12.2.3 Wastewater Treatment

PMRF has two wastewater treatment facilities: (1) a treatment plant .8 km (. mi) south of the Main Gate, and (2) an oxidation pond south of the family housing area. Effluent is discharged to a leachfield situated between the runway and the coast. The average flow for the period June 1 to 31 May 1 was 3 , 1 L (, gal) per day. This represented 3 percent of the design capacity of 8, 2 L (2 , gal) per day. (State of Hawaii, 1 , Oct, p.3) 11

The oxidation pond in the southern portion of the base receives approximately , 3 L (2 , gal) per day of wastewater from Navy family housing and community/personnel support facilities. The capacity of the oxidation-leach pond is 2 , 12 L (, gal) per day. No records are kept of the total daily flow for the stabilization pond. A recent Hawaii Department of Health operation and maintenance report suggested that pump run times from the pump station be used to estimate total daily flows for the pond. (State of Hawaii, 1 , Oct, p.) Effluent from the oxidation pond flows into a series of ad acent leaching ponds, 11
where it is dissipated by percolation and evaporation.

PMRF also has approximately 2 septic tank/leachfield systems and cesspools serving individual buildings in the northern part of the main base.

3.1.1.12.2.4 Water

At PMRF, potable water comes from the Kauai Board of Water Supply and Amfac Sugar-Kauai, who treat it. Total average consumption of Kauai County water by PMRF facilities in 1 was approximately 1 3, L (1,1 gal) per day for the period from 1 July through 1 September 1 . Usage from this source is typically less than one-third of the quantity received from Amfac Sugar-Kauai. The maximum daily delivery capacity of water from the Amfac Sugar-Kauai is 1, ,1 L (288, gal) per day. The amount of water provided to PMRF from the county is limited to 31 , 3 L (82, gal) per day. (~~Hiroaka~~Hironaka, 1 , 13 Jan, p.1) 3

Kauai Board of Water Supply water comes from high level water tunnels above the Mana Plain. It is stored in two , -L (12 , -gal) tanks at Kokole Point and serves the southern portions of the base. Amfac Sugar-Kauai obtains its water from the Mana well, approximately 3 m (1, ft) south of the Kamokala Ridge magazine. This water is pumped to PMRF and stored in one 3 8, -L (1 , -gal) tank and one 1, 8 ,8 8-L (2 , -gal) tank, both near the Main Gate of the installation. Water from this source serves the central and northern portions of the base.

3.1.1.13 Visual and Aesthetic Resources— PMRF/Main Base

Visual resources include natural and man-made features that give a particular environment its aesthetic qualities. Criteria used in the analysis of this resource include visual sensitivity, which is the degree of the public interest in a visual resource and concern over adverse changes to its quality. Visual sensitivity exists in areas where views are rare, unique, or in other ways special, such as remote or pristine environments.

3.1.1.13.1 Region of Influence

The region of influence for visual resources includes the Main Base complex and ad acent area.

3.1.1.13.2 Affected Environment

The physical setting of the area is coastal plain (Mana Plain), coastal dunes, and cliffs. The ma ority of the terrain within this area is relatively flat, except for the coastal dunes found in Polihale State Park and PMRF and the cliffs along the eastern boundary. The elevation within the area ranges from sea level to . m (2 ft) within the coastal plain, to coastal dunes reaching elevations of 3 . m (1 ft), and then to the cliffs reaching elevations of 2 m (8 ft). Given the flat topography of the Mana Plain, prominent vistas and overlooks and views of the ocean are limited. The most visible landscape features are the cliffs on the eastern side of the Mana Plain and the Nohili Dunes on northern PMRF. The natural visual setting on the Mana Plain was altered by the development of sugar cane and the draining of the marshes. This visual setting was further altered by the development of PMRF.

PMRF is bordered by Polihale State Park to the north, by sugar cane fields on the east, the county landfill to the south, and by the Pacific Ocean on the west. The dunes on the north end of PMRF are the highest natural feature on the base, reaching elevations of about 3 . m (1 ft). The Barking Sands dunes have been designated by Kauai County as a Scenic Ecological Area because of the native vegetation and visibility in an otherwise flat landscape. The dunes are covered with thick kiawe which in some places forms a closed canopy of up to . m (2 ft) high. The understory, when present, is made up largely of grasses. The sugar cane fields to the east of PMRF provide various stages of growth and can be very tall, which can obstruct views of the surrounding area from public roads or can provide a view of empty fields. Along State Highway , telephone poles alter the visual environment but do not obstruct views on either side of the highway.

Besides the dunes in northern PMRF, the remainder of the base is relatively flat and consists mostly of non-native vegetation or a man-made environment of roads, mission-related buildings, and fences. Most of PMRF is effectively screened from public view by vegetation along the eastern and southern boundaries and by the sand dunes to the north. However, PMRF facilities can be viewed by the public from State Highway (Polihale State Park access) if there is no developed sugar cane in the fields ad acent to the base. These facilities include a radar unit, control tower, and miscellaneous facilities along the main base entrance. In addition, a communication tower on southern PMRF is visible from the State Highway. Facilities on PMRF do not obstruct any public views of the cliffs on the eastern side on the Mana Plain or the Nohili Dunes.

Public access to PMRF beaches is allowed during certain periods of the day. The beaches have been maintained in a natural setting, with vegetation along the eastern boundary of the beaches effectively blocking the view of the developed base. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.1 -1) 13

3.1.1.14 Water Resources— PMRF/Main Base

Water resources include those aspects of the natural environment related to the availability and characteristics of water. For our purposes, water resources can be divided into three main sections: surface water, groundwater, and flood hazard areas.

Surface water includes discussions of runoff, changes to surface drainage, and general surface water quality. Groundwater discussions focus on aquifer characteristics, general groundwater quality, and water supply. Flood hazard area discussions center on floodplains and their effects on water.

Where practicable, water resources are described quantitatively (volume, mineral concentrations, salinity, etc.) and qualitatively (good, poor, etc.) when necessary.

Note that detailed fresh water quality descriptions, as well as water supply, can be found in the Utilities section of this document. A characterization of ocean water quality is addressed under the Ocean Area section.

3.1.1.14.1 Region of Influence

The region of influence for PMRF/Main Base includes the water resources within and surrounding the PMRF property boundaries.

3.1.1.14.2 Affected Environment

3.1.1.14.2.1 Surface Water

The surface water within the PMRF boundary is in the canals that drain the agricultural areas east of the PMRF. Apart from these drainages, the rain sinks into the permeable sand so that no surface drainage has been established. There are numerous drains and several irrigation ponds in the agricultural land.

The waters in the irrigation ponds generally do not meet drinking water standards for chloride
salts, but have near neutral to slightly alkaline pH (table 3.1.1.1 -1). A surface water quality
study for chloride was conducted in the Mana Plain/KTF area. The chloride levels (figure
3.1.1.1 -1, table 3.1.1.1 -2) do not indicate residual hydrochloric acid effects of the past
launches at KTF. (U.S. Army Program Executive Office, 1 , May, p.3-2) The water in the 12
southern half of PMRF/Main Base is expected to have similar chemical characteristics.
Because the drainage ditches are designed to move water away from the agricultural fields
during irrigation and rainfall, and to leach salts from the soil, no residual effects of past
launches are expected. (U.S. Army Program Executive Office, 1 , May, p.3-2) 12

Water quality along the PMRF shoreline was within DOH standards with the exception of two
locations where sugar cane irrigation water, pumped from the sugar cane fields, is discharged
to the ocean (Belt Collins Hawaii, 1). In these areas, DOH water quality criteria are 8
exceeded within m (1 ft) of the shoreline. Mixing processes are sufficient to dilute the
drainage water to near background levels within to 1 m (1 to 328 ft) from the shoreline
(Belt Collins Hawaii, 1 , 23 July, p.1 through 2). 8

The overlying sediments act as a caprock because of their overall low permeability, although individual layers, such as buried fossil coral reefs, may be as permeable as the basalt. Although the sediments are saturated, they are not exploitable as an aquifer because of unfavorable hydraulic characteristics. The groundwater in the sediments originates as seepage from irrigation percolation and rainfall in the basalt aquifer, especially where the sediments are thin near the inland margin of the Mana Plain.

3.1.1.14.2.2 Groundwater

Bedrock, alluvium, and sand dunes make up hydraulically connected aquifers within the region
of influence. The bedrock (basement volcanics, primarily basalt) is highly permeable,
containing brackish water that floats on seawater. (U.S. Army Space and Strategic Defense
Command, 1 3, Oct, p.3-) 13

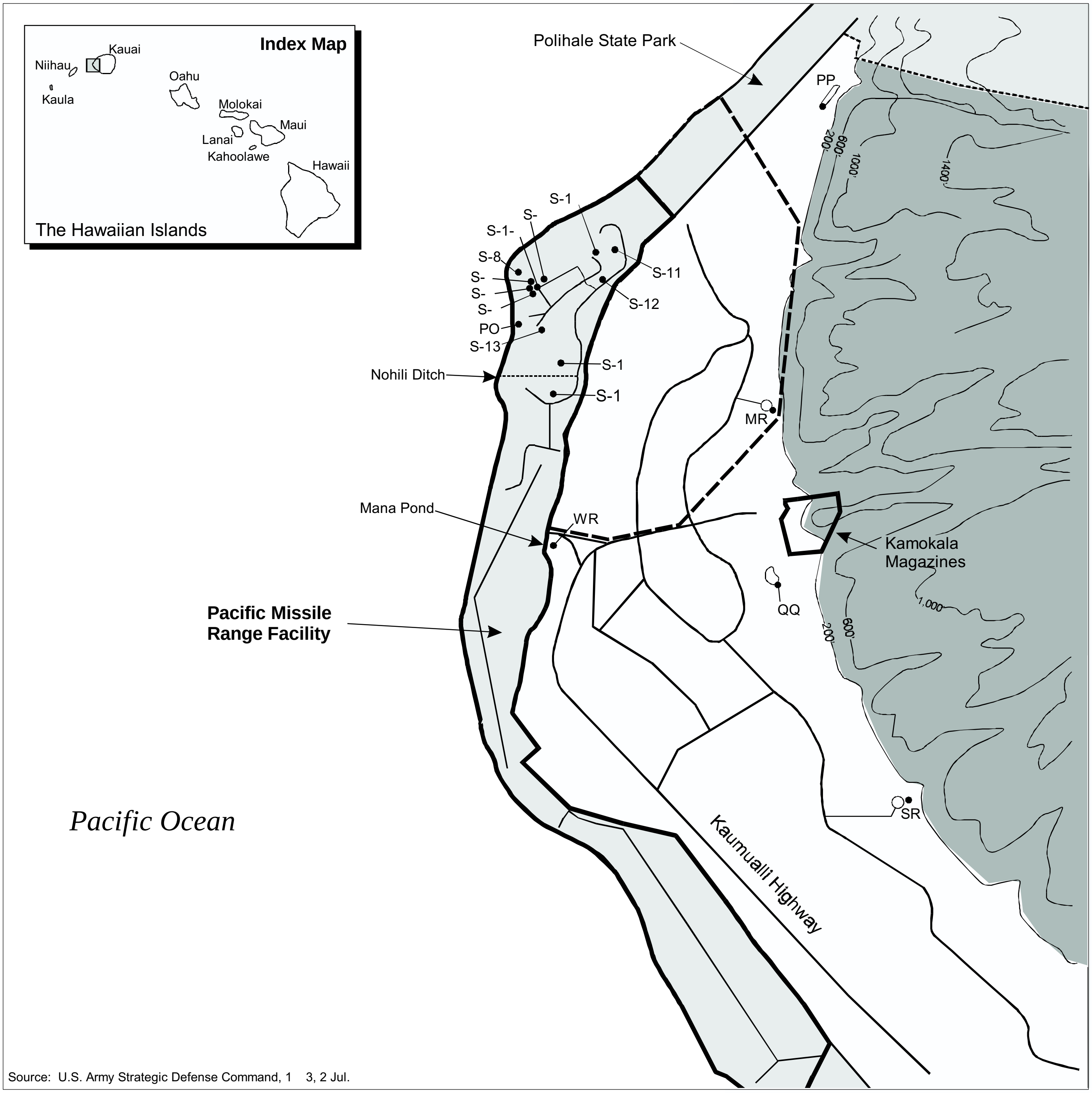
The dune sand aquifer on which PMRF/Main Base lies has a moderate hydraulic conductivity and moderate porosity of about 2 percent. It consists of a lens of brackish groundwater that floats on seawater and is recharged by rainfall and by seepage from the underlying sediments. The only record of an attempt to exploit this groundwater is of a well drilled for the Navy in 1 , . to 8 km (to mi) south of KTF. The well was drilled to a depth of 12.8 m (2 ft), and tested at 1,13 . L per minute (3 gal per minute). In 1 2, the water was too brackish for plants and animals to consume, and consequently, the well is not used. (U.S. Army Program Executive Office, 1 , May, p.3-2) 12

The nearest fresh groundwater sources are in the Napali formation at the inland edge of the coastal plain along the base of the Mana cliffs. Groundwater in the region is generally considered to be potable at the base of the cliffs, increasing in salinity closer to the coast. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-8) 13

Table 3.1.1.14–1: Summary of Field pH and Miscellaneous Field Measurements of Water, Saturated Soil Paste, and Vegetation Wash Water Samples Taken 28 and 29 May 1991 in the Vicinity of PMRF

Sample Site[a]	Air Temp. in °C (°F)	Water Temp. in °C (°F)	pH (std. units) Water	pH (std. units) Soil	pH (std. units) Vegetation
S-1	--	--	--	.3	.
S-2	--	--	--	.	.
S-3	--	--	--	.3	.2
S-	--	--	--	.	.3
S-	--	--	--	.8	.
S-	--	--	--	.	.
S-	--	--	--	8.	.
S-8	--	--	--	8.	.
S-	--	--	--	8.8	.
S-1	--	--	--	.	.
S-11	--	--	--	.3	.2
S-12	--	--	--	8.	.1
S-13	--	--	--	.1	8.
S-1	--	--	--	.	.2
S-1	--	--	--	.	.3
PO	22.8 (3)	2 . (8.1)	8.1	8.2	. (.3)
WR	3 . (8 .1)	28. (8)	.8	8.2	. (.2)
PP	2 . (8 .1)	2 .1 ( )	.1	.3	.3 (.) (.)
MR	2 . (8.1)	2 .1 ( )	.1	.	.8
QQ	2 . (8 .1)	2 . (8 .1)	.	.	.2
SR	2 .1 ( )	2 . (8.1)	.	.1	. (.) (.3)

Source: U.S. Army ~~Space and~~ Strategic Defense Command, 1 3, 2 Jul. 141
Note: Numbers in parentheses indicate duplicate samples. Dashes indicate no data available.



Source: U.S. Army Strategic Defense Command, 1 3, 2 Jul.

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EXPLANATION

- Agriculture
- Agriculture and Hawaiian Home Lands
- Conservation
- Sample Site
- Pacific Missile Range Facility Boundary
- Restrictive Easement Boundary

NORTH

Scale

2 1, Meters

2,3 , Feet

Location of Sampling Sites (Revised)

Kauai, Hawaii

Figure 3.1.1.14-1

pmrf wr 1

Table 3.1.1.14–2: Chloride Levels of Water, Saturated Soil Paste, and Vegetation Wash Water Samples Taken 28 and 29 May 1991 in the Vicinity of PMRF

Sample Site	Water (mg/L)	Soil (mg/kg)	Vegetation (mg/L)
S-1	--	13	3.
S-2	--		.
S-3	--		.
S-	--	3	1.
S-	--	8	.
S-	--	3	.
S-	--	3	2.
S-8	--		.
S-	--		.
S-1	--	32	.
S-11	--		1.
S-12	--	1	3.
S-13	--	32	.
S-1	--		.
S-1	--		.
PO	1 , (1 ,)	12	.
WR	2 , (1 ,)	11 (2)	. (.) (1) (.)
PP	3 (3)	1	1. (.) (.)
MR	388 (388)	13	.
QQ	2 3 (2 3)		1. (.) (1)
SR	1 (1)	18	2. (.) (1)
WRO	22 (223)		. (.)
VM	( )	1	1.

Note: Numbers in parentheses indicate duplicate samples. Dashes indicate no data available.

3.1.2 RESTRICTIVE EASEMENT (GROUND HAZARD AREA)

In order to launch the Vandal missile from PMRF and the Strategic Target System missile from KTF, the U.S. Government must, in accordance with DOD policy, be able to exclude nonparticipants from a ground hazard area. The off-base portion of the respective ground hazard areas is located within a restrictive easement (see figure 3.1-) that was acquired by the U.S. Government. Missile flight safety procedures require that the public and nonessential mission personnel be excluded from the ground hazard area to protect them in the unlikely event of an early flight termination. The ground hazard area within the restrictive easement boundary is an arc of approximately 1,82 m (, ft) for the U.S.

Navy Vandal or a modified arc of approximately 3,048 m (10,000 ft) for the Strategic Target System. The modified arc is described such that the radius is approximately 3,048 m (10,000 ft) to the northeast, approximately 2,774 m (9,100 ft) to the east, and approximately 2,743 m (9,000 ft) to the south. For the purposes of this analysis, a ground hazard area would include both approximate arcs, the 1,829-m (6,000-ft) arc, and the 3,048-m (10,000-ft) modified arc. The current restrictive easement agreement with the State of Hawaii expires on 31 December 2002. PMRF follows the conditions of the restrictive easement as shown in appendix C.

A Final EIS was issued for the acquisition of the restrictive easement in October 1993 and was accepted by the Hawaii Department of Land and Natural Resources. In addition, a ROD was signed in compliance with NEPA. The section below provides an overview of this EIS, including more current data, if available. Table 3.1.2-1 provides the number of times the restrictive easement was activated since ~~October~~ January 1993. To date, PMRF has not closed the restrictive easement without conducting the launch.

Table 3.1.2-1: Activation of the Restrictive Easement, ~~October~~ January 1993–February 1997

Year	Ground Hazard Area 1,829 m (6,000 ft)	Ground Hazard Area 3,058 m (10,000 ft)
~~Oct~~Jan–Dec 1993*	~~0~~1	~~1~~2
Jan–Dec 1994	~~159~~15	1
Jan–Dec 1995	~~17~~1	~~1~~0
Jan–Dec 1996	7	1
Jan–Feb 1997	4	0
Total	28	4

Source: Tasaka, 1998, 26 June, p.1. 117
*Includes launches under Memorandum of Agreement prior to signing of Restrictive Easement.

3.1.2.1 Air Quality—Restrictive Easement (Ground Hazard Area)

3.1.2.1.1 Region of Influence

The region of influence for air quality encompasses the restrictive easement and the Mana Plain.

3.1.2.1.2 Affected Environment

See section 3.1.1.1 for a general description of air quality within the restrictive easement region of influence.

The principal air emission source in the restrictive easement area, and not associated with PMRF/Main Base, is the result of the agricultural practice of burning sugar cane fields in the vicinity, producing periods of heavy smoke and ash. During these burn times, visibility can be reduced over a wide area that sometimes extends for several miles.

3.1.2.2 Biological Resources— Restrictive Easement (Ground Hazard Area)

3.1.2.2.1 Region of Influence

The region of influence for biological resources includes the area within the restrictive easement boundary in which potential impacts could occur during launch activities.

3.1.2.2.2 Affected Environment

Within the region of influence, human activities have altered most of the natural environment. Most of the land in the restrictive easement boundary, except for Polihale State Park, is used for growing sugar cane. Although portions of Polihale State Park within the region of influence support relatively undisturbed vegetation in the dunes, visitor foot traffic and off-road vehicle use have threatened this ecologically sensitive area. The characteristics of the existing conditions for the biological resources within the ground hazard area were described in the Strategic Target System EIS. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1) 13

3.1.2.2.2.1 Vegetation

The vegetation in the restrictive easement area is dominated by sugar cane, ruderal vegetation, and wetlands associated with agricultural ponds and drains. The dominant vegetation within the region of influence is sugar cane with ruderal vegetation, wetlands, and a mosaic of non-native and native vegetation also present. The non-native non-agricultural vegetation is dominated by kiawe/koa haole. This vegetation type is the dominant type present on the relatively undisturbed areas of the sand dunes, associated with PMRF and Polihale State Park, as well as along the cliff face in the restrictive easement area. The sand dune vegetation within the region of influence is a mosaic of five native plant communities and the dominant kiawe/koa-haole scrub. Because of the restrictions on off-highway vehicle activities, the sand dune related vegetation within the PMRF boundary is less disturbed than the vegetation in Polihale State Park. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1) 13

Because of their small areal extent and the mosaic character of the overall vegetation, none of the five native plant communities potentially present can be mapped at a practical and visible scale for use in this EIS therefore, the communities are discussed briefly below: (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1 and 3-11) 13

- Aalii Lowland Dry Shrubland is dominated by the indigenous shrub species aalii (*Dodonaea viscosa*) which is known to occur throughout the tropics.
- Pohinahina Coastal Dry Shrubland is dominated by the indigenous shrub pohinahina (*Vitex rotundifolia*) which is known from other coastal locations in the Pacific and Indian oceans. Within the region of influence, this community cannot be mapped separately from the naupaka coastal dry shrubland.
- Naupaka Coastal Dry Shrubland is dominated by the indigenous species naupaka (*Scaevola sericea*), a coastal plant widespread throughout the tropical

and subtropical Pacific and Indian oceans. Within the region of influence, this community cannot be mapped separately from pohinahina coastal shrubland.

- Akoko Coastal Dry Shrubland is dominated by the endemic spurge species akoko (*Chamaesyce celastroides*) and is considered extremely rare.
- Akiaki Coastal Dry Grassland is dominated by the indigenous grass species akiaki (*Sporobolus virginicus*) which is known from other tropical and subtropical coastal locations. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-) 13

3.1.2.2.2.2 Wildlife

The same species discussed in section 3.1.1.3 would be expected to occur within the restricted easement area and the region of influence.

3.1.2.2.2.3 Threatened and Endangered Species

The sensitive, threatened, and endangered species expected to occur within the restrictive easement are the same as those discussed under section 3.1.1.3.

3.1.2.3 Cultural Resources— Restrictive Easement (Ground Hazard Area)

3.1.2.3.1 Region of Influence

The region of influence for cultural resources under the Proposed Action and all alternatives encompasses the approximate 8 -ha (2,11 -ac) restrictive easement area that is owned by the State of Hawaii and Amfac Sugar-Kauai. The Federal and non-Federal land areas potentially affected by the launch activities leading to the need for this restrictive easement have been described and assessed in previous environmental documents. (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-2 through 3-3 , p. -3 through -31 U.S. Army 13
Space and Strategic Defense Command, 1 3, Oct, p.3-1 through 3-1 , p. - through -) 13

3.1.2.3.2 Affected Environment

3.1.2.3.2.1 Records Search

A thorough record search encompassing the restrictive easement area region of influence was performed in 1 1 and 1 2 in preparation for the analyses for the Draft and Final EISs for the Strategic Target System program at the PMRF and in 1 3 for the Draft and Final EISs for the restrictive easement. Repositories searched included the Bishop Museum, the U.S. Navy Pacific Division Naval Facilities Engineering Command Planning Department, Hawaii Department of Land and Natural Resources, State Parks Division, and the libraries of the Hawaii Department of Land and Natural Resources, State Historic Preservation Division (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1 through 3-1). A listing of all 13
sites currently known to exist in the restrictive easement region of influence is presented in table 3.1.2.3-1. Treatment categories were not determined for sites known to exist within the restrictive easement (ground hazard area) region of influence. They are situated on State and Amfac Sugar-Kauai lands.

Table 3.1.2.3–1: Cultural Resources Sites Located Within the Restrictive Easement Region of Influence

State of Hawaii Inventory Site #	Site Description
-3 - 1-	Kapaula Heiau at Kolo
-3 - 1-	Dune Burials and campsites between Polihale and Barking Sands
-3 - 1-	House sites near the northern portion of Barking Sands
-3 - 1- 2	Former plantation camp
-3 - 1-182	Basalt, coral, shell and metal shrapnel scatter near Barking Sands
-3 - 1-1821	Basalt scatter near Barking Sands
-3 - 1-18	Historic house site (unction of Polihale Road and Queens Road)
-3 - 1- 1	Paving and associated wall
-3 - 1- 18	Retaining wall abuts large natural boulders at either end
-3 - 1- 1	Small rectangular ahu/platform, possible burial cairn
-3 - 1- 2	Terraces
-3 - 1- 21	Stone wall
-3 - 1- 2	Historic irrigation channel

Source: State of Hawaii, 1 , Nov U.S. Department of the Navy, 1 , Aug, p.33 Flores, Kaohi, and Gonzalez, 1 3, Jul, pIV-1 . 106, 167

3.1.2.3.2.2 Archaeological Resources (Prehistoric and Historic) 189

The restrictive easement region of influence is situated within the area of Mana specifically referred to in Hawaiian literature and oral tradition as *aleina-a-ka-uhane*, a place (generally cliffs or seacoast promontories) where the spirits of men, after death, plunge into eternity and are divided into one of three spiritual realms: the realm of the wandering spirits the realm of the ancestral spirits or the realm of the endless night). Typical of native Hawaiian mortuary practices, burial sites believed to be associated with the Mana*leina-a-ka-uhane* have been identified throughout the cliffs and dunes (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1). 13

A 1 -percent archaeological inventory survey of the region of influence s Area of Potential Effect has not been performed. However, surveys conducted by Thrum (1), Bennett (1 31), Kikuchi (1), Ching (1), Cleeland (1), Bordner (1), Sinoto (1 8), Kennedy/Jenks Engineers (1 82), ent (1 82), McMahon (1 88), Douglas (1), Gonzalez et al. (1), Walker and Rosendahl (1), Welch (1), ent (1 1), Flores, Kaohi, and Gonzalez (1 3), O Hare and Rosendahl (1 3), the U.S. Navy (undated), studies by Kikuchi (1 8) and the State of Hawaii Division of State Parks (1 3 and 1) have identified burial sites, heiaus (temples), campsites, house sites, lithic scatters, and aquaculture ponds, any or all of which could be potentially eligible for the National Register undoubtedly, many other sites remain unrecorded (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1). Surveys by archaeologists (ent, 1 3 and 1) from the Division of State Parks in the 13 Polihale State Park and central region of influence areas have relocated sites previously recorded by Bennett (1 31) and Ching (1) (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1 13

ent, 1 , 8 Sep). These site records are being updated to reflect the State Park s 18
expanded boundaries. Other sites (typical of those described above) have been recently recorded. A 1 3 archaeological survey undertaken by the State of Hawaii s Department of Parks and Recreation of the area immediately bordering Polihale State Park indicates that other sites may exist within the region of influence that could be of potential significance (ent,
1 , 8 Sep). One additional site that had not been previously recorded in the region of 18
influence was identified during this survey. This site (-3 - 1-18) is the location of a historic house that was moved in its entirety to Kekaha. No visible remains of historic
occupation were noted at the site location (State of Hawaii, 1 , Oct, p.1 , 32 through 33). 1
The nearest National Register-eligible site is the Nohili Dune, which is eligible as a traditional
cultural property (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1). 13

3.1.2.3.2.3 Historic Buildings and Structures

As described above, historically large portions of the restrictive easement area have been used for agricultural/aquacultural purposes. To ensure this land use, the area has been designated by the State and zoned by the County of Kauai specifically for this purpose. In addition, Polihale State Park, at the northern end of the region of influence, was established in 1 . Because of this, the construction of buildings and structures has been limited, and there are currently no inhabited buildings within the restrictive easement area. The only known structures are the remains of heiaus and house sites at Saki Mana and the remnants of the railway system that once served the local sugar cane industry. These were treated as archaeological sites for the purposes of this analysis. There are no known listed National
Register historic buildings or structures within the region of influence (ent, 1 , 8 Sep). 18

3.1.2.3.2.4 Traditional Resources

Traditional resources can include archaeological sites, burial sites, ceremonial areas, caves, mountains, water sources, trails, plant habitat or gathering areas, or any other natural area important to a culture for religious or heritage reasons. As such, most of the cultural materials identified within the region of influence could also be considered traditional resources. Traditional cultural sites, particularly cemeteries, indicate that, in addition to the native Hawaiians, numerous cultures have also peopled the Island of Kauai: Japanese, Korean, Portuguese, Chinese, and Filipino. Within the region of influence, all of the traditional cultural materials identified to date have been associated with native Hawaiians however, a Japanese cemetery is located nearby within the boundary of PMRF. Cemeteries associated with each of the other cultures are located near Kekaha, Hanapepe, and Waimea. As described above, the
only known National Register-eligible traditional site in the PMRF area is the Nohili Dune
(United States Army Space and Strategic Defense Command, 1 3, Oct, p.3-1). Given that 13
the region of Mana is situated within proximity to a *leina-a-ka-uhane,* the entire restrictive easement area could be considered to be within a traditional cultural area.

3.1.2.4 Geology and Soils— Restrictive Easement (Ground Hazard Area)

3.1.2.4.1 Region of Influence

The region of influence for geology and soils includes the area within the restrictive easement boundary. The region of influence is situated within a lowland portion of the Kekaha coastal flat.

3.1.2.4.2 Affected Environment

3.1.2.4.2.1 Physiography

The region of influence is situated within a lowland portion of the Kekaha coastal flat. The general area is part of what is known as the Mana Plain, which extends from Polihale State Park in the north to Waimea in the south. The restrictive easement is bounded on the north and west by sand dunes and the Pacific Ocean and on the east by steep cliffs and valleys ascending along the Mana and Ohaiula ridges. Perennial and intermittent streams drain toward the lowland area of the Mana Plain and to the Pacific Ocean west and northwest of the steep cliffs and valleys. The eastern portion of the restrictive easement slopes with increasing elevation from the base of the Mana cliffs at 12.2 m (ft) mean sea level to the top of the cliffs at 2 3.8 m (8   ft) mean sea level over an approximate distance of 3   m (1,3   ft). The elevation of the sand dunes located to the north and west ranges between 3 .   m (1   ft) and 3 m (1   ft) mean sea level. For the remaining portion of the restrictive easement, the elevation ranges between 12.2 m (ft) and mean sea level. The ma ority of the land within the restrictive easement is reclaimed marshland currently used for agricultural purposes and is below 12.2 m (ft) mean sea level.

3.1.2.4.2.2 Geology

Kauai is the oldest of the eight main Hawaiian Islands and consists of a single great shield volcano similar to Mauna Loa on the Island of Hawaii. Formation of Kauai was probably completed before the end of the Pliocene epoch (U.S. Army Strategic Defense Command,
1   2, Feb, p.3-2). As a result of the intermittent nature of subsequent volcanic eruptions, 13
many lava flows were eroded by streams and later covered by new lava flows.

The Mana Plain is made up of a wedge of terrestrial and marine sediments overlying volcanic basement rocks that consist of the Napali Formation of the Waimea volcanic series~~(Botanical Consultants, 1 8)~~. The basement rock crops out at the inland edge of the plain above an elevation of about 12.2 m (ft). The volcanic basement plunges below the Mana Plain at a dip of about   degrees until, at the coast, its contact with the overlying sediments is approximately 121.   m (ft) below sea level (U.S. Army Strategic Defense Command, 1   2,
Feb, p.3-3). 13

The Mana Plain is composed of alluvium, lagoon deposits, and beach and dune sands. On its inland edge, lagoonal deposits are earthy, overlain by younger alluvium, and probably grade into or interfinger with older alluvium. On the seaward side the deposits are mostly calcareous and probably grade into barrier beach deposits. Clay beds contain gypsum in some places.
(U.S. Army Strategic Defense Command, 1   2, Feb, p.3-3) 13

The restrictive easement is located on an extension of the Mana Plain, which consists of brown and red terrestrial alluvium (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3) and 13
flattened dunes that have little relief. The surface typically consists of fine to moderately fine reclaimed soils suited for agricultural purposes.

The fossil dunes within the area consist of fine sand, which is loose at the surface but weakly to strongly indurated (hardened) a few meters below the surface (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3). Typical of windblown deposits, the indurated sands are bedded 13
as laminae several centimeters thick and contain a fine grain size and an admixture of silty sand. Clay is also part of the mixture, but it appears primarily where the dunes dissipate and are replaced by alluvium (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-3). 13

3.1.2.4.2.3 Soils

The USDA Soil Conservation Service has published a soil survey (U.S. Department of Agriculture, 1 2, Aug) that includes the area within the restrictive easement and the ground 1
hazard area within PMRF. This area consists of alluvium, lagoon deposits, and calcareous beach and dune sands. The dominant soil within the restrictive easement area has been mapped (figure 3.1.2. -1) as the Kekaha-Nohili Association. This association, which makes up 2 percent of the Island of Kauai (U.S. Department of Agriculture, 1 2, Aug, p.), consists of 1
well-drained and poorly drained, medium-textured to very fine soils on the Mana coastal plain. These soils are nearly level and are developedupon ~~by~~ alluvium. Kekaha soils make up about percent of the association, and Nohili soils make up 1 percent. The rest of the association is made up of fill land and Kaloko, Lualualei, and Mamala soils (U.S. Department of Agriculture, 1 2, Aug, p.). Kekaha soils consist of a dark reddish-brown, friable silty clay, 1
clay, or extremely stony silty clay loam. The subsoil is dark reddish-brown, firm silty clay or clay. The substratum is stratified alluvium and marine clay (U.S. Department of Agriculture, 1 2, Aug, p.). Nohili soils have a surface layer of dark reddish-brown, firm clay and a 1
subsoil of dark-brown to very dark-gray, mottled, firm clay. The substratum is a marly clay (U.S. Department of Agriculture, 1 2, Aug, p.). 1

The soil within the ground hazard area on the PMRF consists of the Jaucas Series as described in the Strategic Target System DEIS (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-). 13

According to the Agricultural Lands of Importance to the State of Hawaii (ALISH) map for Kauai (Hawaii Department of Agriculture, 1), the land within the restrictive easement is 1
designated as Prime or Other Important Agricultural Land (figure 3.1.2. -2). Lands within the PMRF are not designated as agricultural land. Agricultural lands identified by the Hawaii Department of Agriculture (1) are as follows: 1

- Prime Agricultural Land is defined as land that has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods.

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EXPLANATION

Restrictive Easement Boundary

Kauai Test Facility

Pacific Missile Range Facility

200 Contour Lines (ft)

Scale

1 Meters

1, 3, Feet

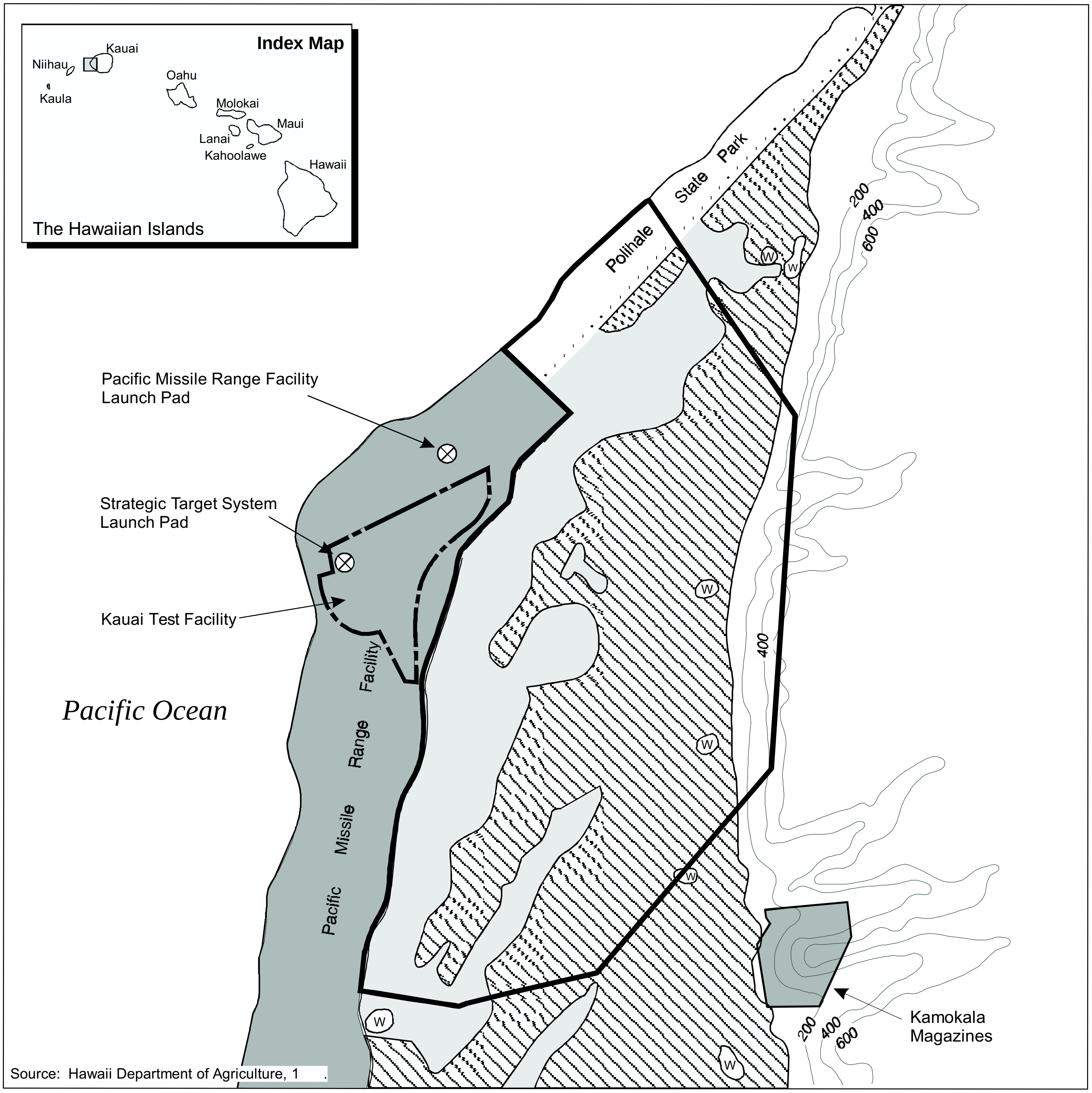
NORTH

Restrictive Easement Soil Map (Revised)

Kauai, Hawaii

Figure 3.1.2.4-1

pmrf gs 1



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EXPLANATION

- Restrictive Easement Boundary
- Polihale State Park Boundary
- Kauai Test Facility
- Prime Agricultural Land
- Other Important Agricultural Land
- Pacific Missile Range Facility
- Water Ponds
- Contour Lines (ft)

NORTH

Scale

1 Meters

1, 3, Feet

Agricultural Lands of Importance to the State of Hawaii Within the Region of Influence (Revised)

Kauai, Hawaii

Figure 3.1.2.4-2

pmrf gs 2

- Important Agricultural Land is defined as land other than Prime or Unique Agricultural Land that is also of Statewide or local importance for agricultural use.

Article I, Section 3, of the Hawaiian Constitution states that the State shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self sufficiency and assure the availability of agriculturally suitable lands. Lands identified by the State as important agricultural lands needed to fulfill the purposes above shall not be reclassified...

Along the ocean margin of the restrictive easement are areas of dune land and beaches (U.S.
Army Strategic Defense Command, 1 2, Feb, p.3-). Dune land consists of hills and ridges 13
of sand drifted and piled by the wind. The hills and ridges are actively shifting or are so
recently fixed or stabilized that no soil horizons have developed. The sand derives
predominantly from coral and seashells (U.S. Army Strategic Defense Command, 1 2, Feb,
p.3-). The surface typically consists of loose sand. 13

Elevated lead concentrations in soil samples taken from the KTF indicated a maximum
concentration of 2 mg/kg. The maximum lead concentration observed was not an
actionable level requiring cleanup under existing laws and regulations (U.S. Army Strategic
Defense Command, 1 2, Feb, p.3-). 13

3.1.2.5 Hazardous Materials and Waste— Restrictive Easement (Ground Hazard Area)

3.1.2.5.1 Region of Influence

The region of influence encompasses the area within the restrictive easement boundary.

3.1.2.5.2 Affected Environment

3.1.2.5.2.1 Hazardous Materials

Within the restrictive easement property boundary, hazardous materials are used in the production of sugar cane, including fuels, oils, hydraulic fluid, herbicides, and pesticides. There is no hazardous materials usage associated with activities at Polihale State Park.

Hazardous materials and waste handling policies and procedures on PMRF follow all regulatory requirements as described in section 3.1.1. , Hazardous Materials and Hazardous Waste.

3.1.2.5.2.2 Hazardous Waste

According to the Hawaii State Department of Health, there have been no known reported unauthorized releases of any hazardous materials or waste within the restrictive easement boundary. Hazardous materials and waste handling policies and procedures on PMRF follow all regulatory requirements.

3.1.2.6 Health and Safety— Restrictive Easement (Ground Hazard Area)

3.1.2.6.1 Region of Influence

The region of influence encompasses the restrictive easement area in which allpotentially hazardous debris from a terminated launch would fall.

3.1.2.6.2 Affected Environment

Health and safety issues within the region of influence include those associated with clearing the ground hazard area of persons during missile launches from PMRF and KTF. Any failure of the missile system that would cause potentially hazardous debris to fall outside the ground hazard area would be detected by the Missile Flight Safety Officer who would terminate the missile flight before it could escape the hazard boundary. To ensure the protection of all persons and property, safety procedures have been established and implemented. These standard operating procedures include establishing road control points and clearing the area using vehicles and helicopters (if necessary). The road control points are established 3 hours prior to launch to allow security forces to monitor traffic as it passes through the ground hazard area. At 2 minutes prior to launch, the area is determined to be clear of the public to ensure that, in the unlikely event of early flight termination, no in uries or damage to persons or property would occur. After the Range Safety Officer declares the area safe, the security force gives the all-clear signal, and the public is allowed to reenter the area. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-21) 13

3.1.2.7 Land Use— Restrictive Easement (Ground Hazard Area)

This section provides an overview of the regional land use, land use plans, coastal zone management, and recreation resources within the restrictive easement boundary. For land use outside this area see section 3.1.1.8.

3.1.2.7.1 Region of Influence

The region of influence for land use includes the area within the restrictive easement boundary.

3.1.2.7.2 Affected Environment

3.1.2.7.2.1 Land Use

The general land use activity within the restrictive easement is recreation and agriculture. The area within the restrictive easement is classified agricultural and conservation by the State for planning purposes (see figure 3.1.1.8-3). The agricultural district includes lands for the cultivation of crops, aquaculture, raising livestock, wind farming, forestry, agriculture support activities, and land with significant potential for agriculture uses. Golf courses and golf-related activities may also be included in the district, provided the land is not in the highest productivity categories (A or B) of the Land Study Bureau s detailed classification system. The agricultural land within the restrictive easement that is currently used for the development of sugar cane has a productivity rating of A and B. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p. -) 13

Conservation lands include areas necessary for protecting watersheds, scenic and historic areas, parks, wilderness, forest reserves, open space, recreational areas, habitats of endemic plants, fish and wildlife, and all submerged lands seaward of the shoreline. The conservation district also includes lands sub ect to flooding and soil erosion. The conservation land within the restrictive easement is currently occupied by Polihale State Park and PMRF. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p. -) 13

The Waimea-Kekaha Regional Plan and Kauai General Plan zoned the land within the restrictive easement as open and agricultural. The land occupied by Polihale State Park and PMRF is designated by the State as conservation and is outside the zoning urisdiction of the county.

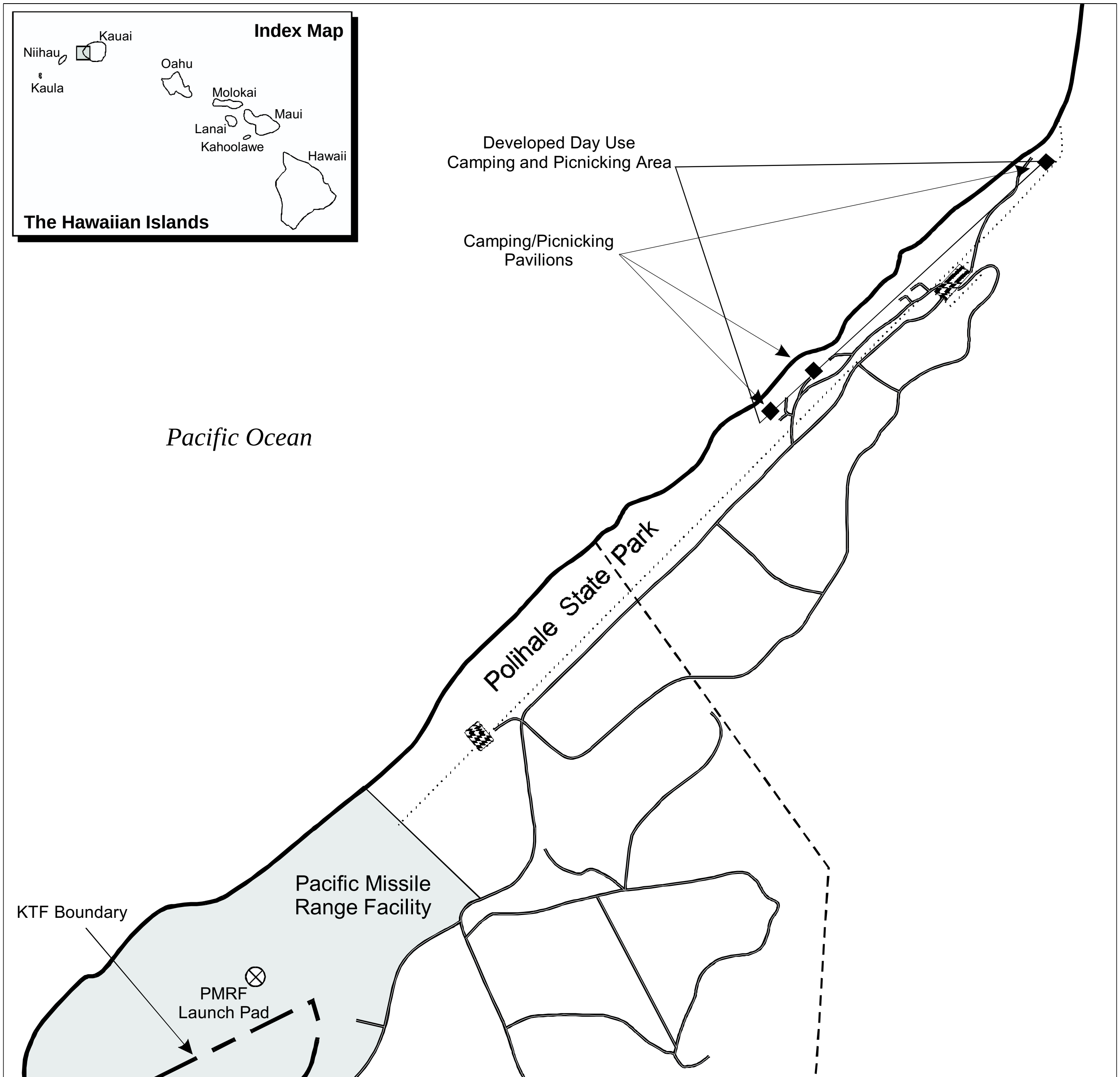
As part of the Coastal one Management Act Program, the County of Kauai has established guidelines (County of Kauai, undated, p.1) for the review of developments proposed for special 1
management areas (see figure 3.1.1.8-1). A small area ust east of PMRF North Gate and Polihale State Park has been designated as a special management area. Any development in these areas requires a special management use permit.

3.1.2.7.2.2 Recreation

The only State or county recreation area within the region of influence is the approximate - ha (1 -ac) Polihale State Park, of which approximately 28 ha (ac) of the southern extent is within the restrictive easement boundary (figure 3.1.2. -1). Polihale State Park is operated by the DLNR Division of State Parks. According to HRS 18 - , the duties of the DLNR are to preserve the park in its natural condition so far as may be consistent with its use and safety and improve it in a manner to retain to the maximum extent its natural, scenic, historic, and wildlife value for the use and en oyment of the public.

Polihale State Park is used for swimming, shore fishing, native Hawaiian subsistence fishing, picnicking, tent camping, and trailer camping. Amenities are provided for day-use picnicking (for example, pavilions), and there are approximately 11 developed sites for overnight camping. The Division of State Parks estimated day use to average , persons per year, with approximately 1,822 permits being issued for overnight camping between July 1
and June 1 (Souza, 1 , 1 Oct, p.1). The area within the restrictive easement boundary 1 3
contains no developed camp sites or picnicking areas. Access to the north area of the State park where the developed campsites and picnicking areas exist is provided by an 8-km (-mi) dirt road from Highway through the cane fields and the ground hazard area.

Currently, the Division of State Parks is planning a possible expansion of Polihale State Park (figure 3.1.2. -2) that would include a portion of the sugar cane fields and cliffs ad acent to the park boundary. There is no date for when the expansion of Polihale State Park would occur because of lack of funding. Sugar cane production or other agricultural uses would be allowed to continue under the proposed expansion program. The purpose of the expansion is to encompass sensitive cultural resources and biological resources within the park boundary no park development, other than interpretive trail signs, is anticipated within the proposed expansion area. Currently, there is no formal date for the possible expansion of the State Park
(Souza, 1 , 8 Aug, p.1). 1 2



Source: U.S. Army Space and Strategic Defense Command, 1 3, Oct, p. 3-3 .

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EXPLANATION

Parking Areas

Restrictive Easement Boundary

Polihale State Park Boundary

Kauai Test Facility

PMRF Pacific Missile Range Facility

NORTH

Scale

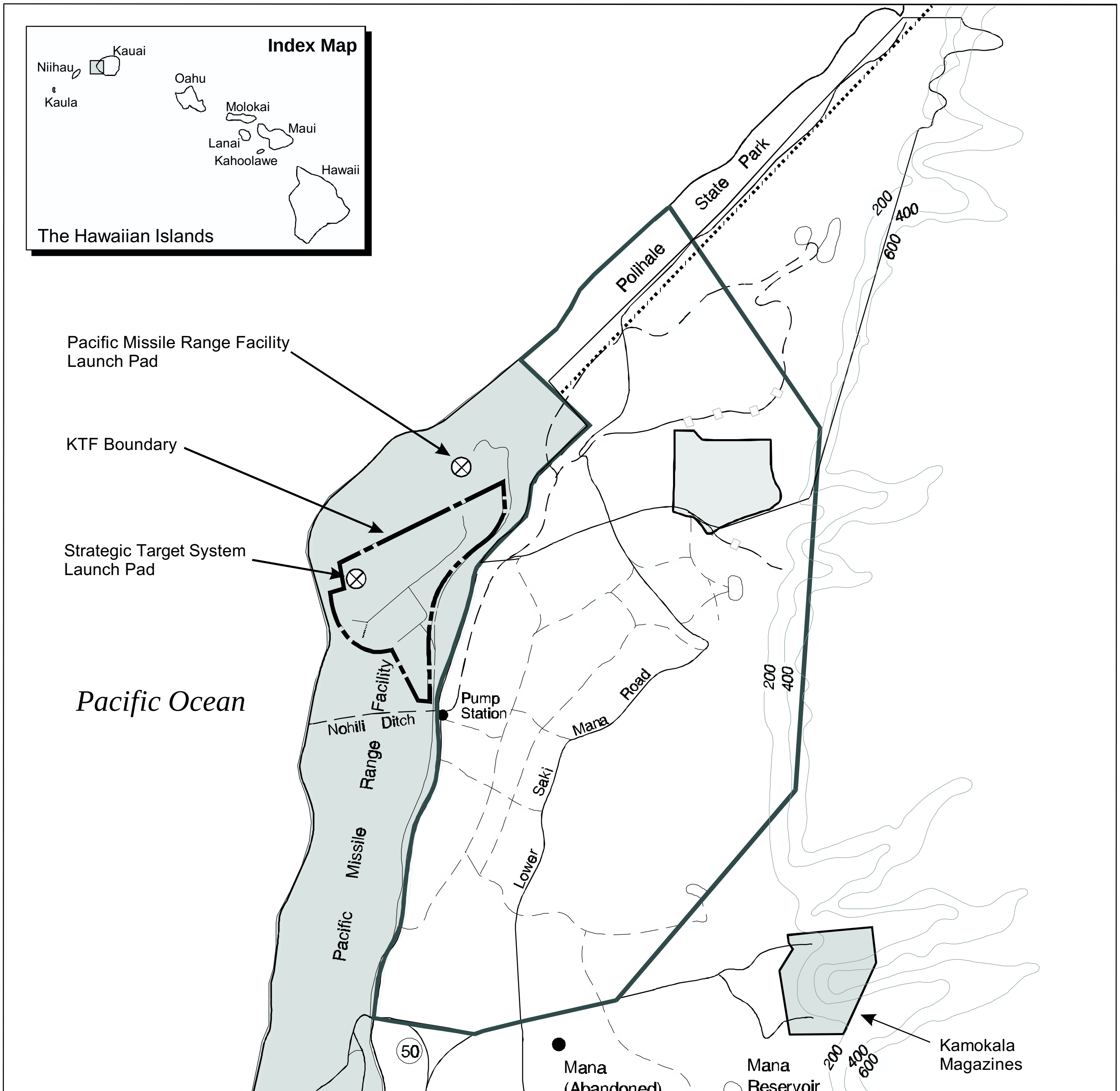
3 Meters

1, 2, Feet

Polihale State Park

Kauai, Hawaii

Figure 3.1.2.7-1



Source: U.S. Army Space and Strategic Defense Command, 1 3, Oct, p. 3-3 .

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EXPLANATION

Irrigation Drainage Ditch

Restrictive Easement Boundary

Polihale State Park Boundary

Kauai Test Facility

Pacific Missile Range Facility

Possible Expansion Area

50 State Highway

200 Contour Lines (ft)

Scale

1 Meters

1, 3, Feet

NORTH

Possible Expansion Area for Polihale State Park (Revised)

Kauai, Hawaii

Figure 3.1.2.7-2

pmrf rec 2

3.1.2.8 Noise— Restrictive Easement (Ground Hazard Area)

3.1.2.8.1 Region of Influence

The region of influence for noise includes the restrictive easement boundary.

3.1.2.8.2 Affected Environment

The primary noise sources within the region of influence are associated with PMRF, KTF, sugar cane production, road traffic, and recreational activities. These noise sources are imposed on the natural environment. The sounds from the natural environment come from the ocean, trees, birds, animals, and prevailing weather conditions.

Noise sources from PMRF and KTF include target drones, aircraft, helicopters, rocket and missile launches, and daily base operations. Noise levels on PMRF near the runway average L_{dn} dBA. Locations on base away from the runway are typical of a commercial area with noise levels around L_{dn} dBA or less. Infrequent, short-term launch noise from PMRF and KTF has come from Strategic Target System, STR PI, and other small rocket launches. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1) For example, noise 13
generated by a Strategic Target System launch was measured at12 dBA 1 m (ft) from the launch pad and dBA at 3, 8 m (1 , ft) from the pad.

Noise sources from sugar cane production within the restrictive easement include heavy equipment (for example, bulldozers, cranes, and large haul trucks) used during planting and harvesting and small maintenance trucks used during the remainder of the growing season. Noise levels from a heavy truck at 1 .2 m (ft) can be as high as 8 dBA. Additional noise sources in the area include traffic traveling to Polihale State Park on the dirt road through the cane fields. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1) 13

Noise sources at Polihale State Park include wave action, vehicle traffic, and off-road vehicles (for example, four-wheel-drive vehicles, all-terrain vehicles, motorcycles) which drive on the beach and in the sand dunes. Noise levels from an unmuffled motorcycle can be as high as 11 dBA at . m (1 ft). Outside of the intermittent high noise sources, noise levels at Polihale State Park can be expected to be typical of a wilderness or rural environment with levels from 1 to 3 dBA. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1) 13

3.1.2.9 Socioeconomics— Restrictive Easement (Ground Hazard Area)

3.1.2.9.1 Region of Influence

The restrictive easement includes prime and other important agricultural land located in census tract (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-22). For this 13
reason, Kauai s western portion represents the Primary Impact Area (PIA), within an overall region of influence that includes the whole of Kauai County.

3.1.2.9.2 Affected Environment

See section 3.1.1.1 for a detailed discussion of the socioeconomic character of Kauai and the restrictive easement area.

3.1.2.10 Transportation— Restrictive Easement (Ground Hazard Area)

3.1.2.10.1 Region of Influence

The region of influence includes State Highway and Kao Road that access the restrictive easement from the southwest and a dirt road (Lower Saki Mana Road) within the restrictive easement that provides access to Polihale State Park. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-22) 13

3.1.2.10.2 Affected Environment

State Highway , also referred to as Kaumuali Highway, is a main traffic artery that passes through most of the communities of the island. Highway traverses almost the entire southern portion of the island from the north gate of PMRF (on the west) to ust north of Lihue (on the east). (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-22) 13

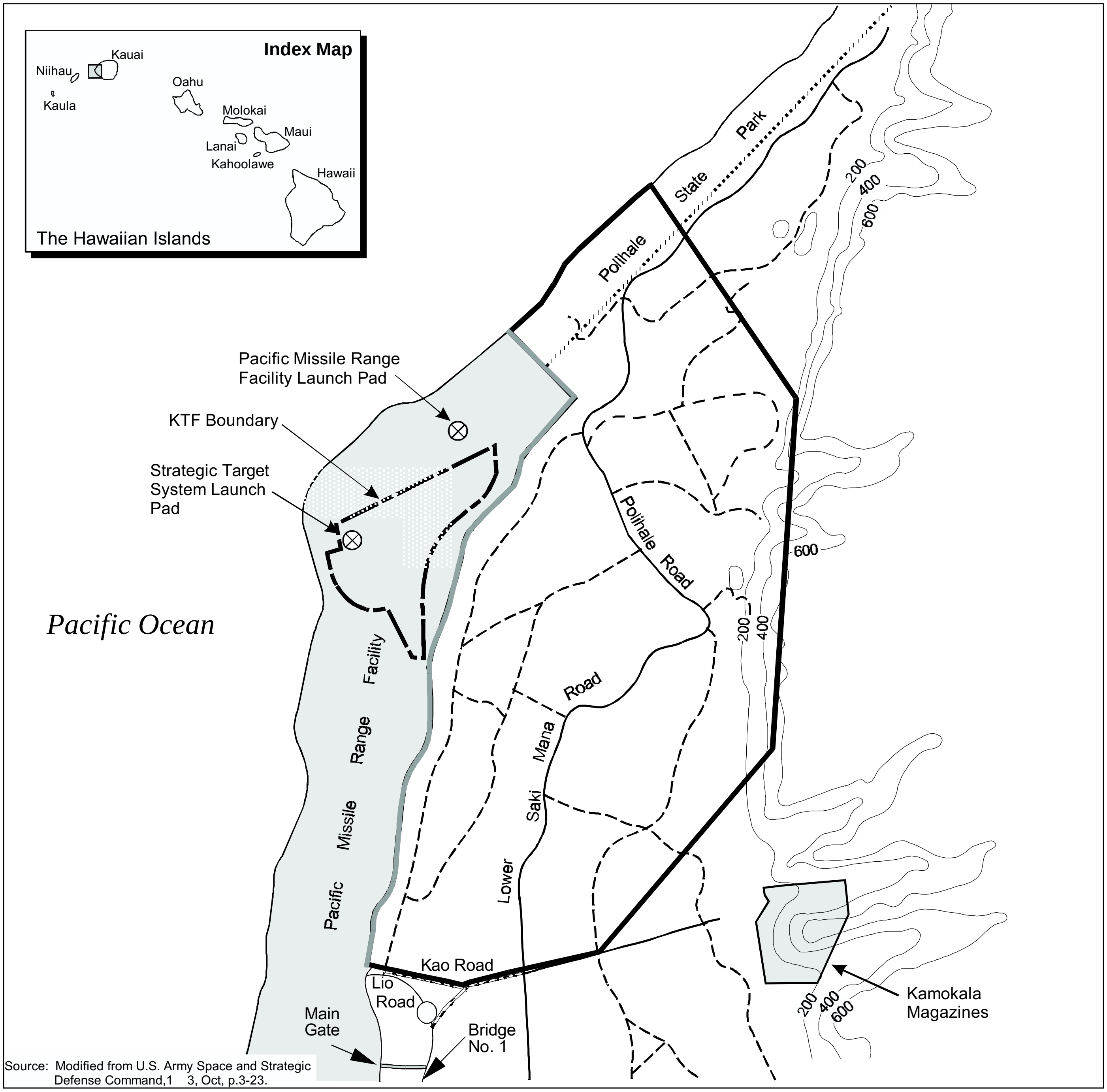
Kao Road is designated as a county road that runs east toward Lower Saki Mana Road. The paved road parallels the southern boundary of the restrictive easement. The county responsibility ends at the intersection with Lower Saki Mana Road. Lower Saki Mana Road, which becomes Polihale Road, provides access to Polihale State Park (figure 3.1.2.1 -1) and is designated as a State Road. The unpaved Lower Saki Mana Road is used by Amfac Sugar-Kauai and State Park visitors. Amfac Sugar-Kauai maintains the road primarily for the heavy equipment needed to plant and harvest the sugar cane. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-22) 13

The nearest data point for traffic count information to the restrictive easement is from bridge No. 1 located approximately .8 km (3 mi) south of the restrictive easement and ust south of the Main Gate entrance to PMRF. The traffic monitoring survey data from 1 and 1 October 1 1, the latest data available, indicated a 2 -hour total volume of 2,21 vehicles and a morning and afternoon peak-hour volume of 288 and 3 2 vehicles, respectively (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-22). 13

3.1.2.11 Utilities— Restrictive Easement (Ground Hazard Area)

3.1.2.11.1 Region of Influence

Infrastructure affected by the restrictive easement includes electricity and water supply. The region of influence for infrastructure includes those systems within or immediately ad acent to the restrictive easement area.



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EXPLANATION

Restrictive Easement Boundary
Kauai Test Facility
Polihale State Park Boundary
Amfac Sugar Kauai
Private Haul Roads
Pacific Missile Range Facility

State Highway
County Road
Polihale Road — State Road
200 — Contour Lines (ft)

Scale
1 Meters
1, 3, Feet
NORTH

Road Ownership Within Restrictive Easement

Kauai, Hawaii

Figure 3.1.2.10-1

3.1.2.11.2 Affected Environment

3.1.2.11.2.1 Electricity

Commercial electricity in the region of influence is supplied by both the Kauai Electric Company and Amfac Sugar-Kauai. Amfac Sugar-Kauai provides power to the pumps that drain the Mana Plain, and the Kauai Electric Company supplies power to PMRF. The Amfac Sugar-Kauai power line traverses the restrictive easement along the base of the Mana cliffs supplying the drip irrigation pumps within the restrictive easement area. Commercial electricity is supplied to PMRF along the southern boundary of the restrictive easement by the Kauai Electric Company via a 2,1 -kW capacity line, which is ample supply for PMRF s 1,3 -kW demand. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-21) 13

3.1.2.11.2.2 Water Supply

Potable water is supplied to the area from two wells ad acent to the restrictive easement located to the north at Polihale State Park and to the south at Mana Shaft. Both wells are located at the base of the cliffs. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-21) 13

Water from the Mana Shaft well is used to supply fresh water to PMRF and agricultural fields. The capacity of the well has a maximum sustained yield of 22. million L (million gal) per day. The water from the well is pumped through a 2 .3-cm (8-in.) diameter water supply line that parallels the southern boundary of the restrictive easement. Water from the well at Polihale State Park is used exclusively for park visitors.

3.1.2.12 Visual and Aesthetic Resources— Restrictive Easement (Ground Hazard Area)

3.1.2.12.1 Region of Influence

The region of influence for visual resources includes the southern end of Polihale State Park along the Pacific Ocean, the sugar cane fields on the Mana Plain, and the cliffs on the eastern boundary of the Mana Plain.

3.1.2.12.2 Affected Environment

Visual resources include natural and man-made features that give a particular environment its aesthetic qualities. Criteria used in the analysis of this resource include visual sensitivity, which is the degree of the public interest in a visual resource and concern over adverse changes to its quality. Visual sensitivity exists in areas where views are rare, unique, or in other ways special, such as remote or pristine environments.

The physical setting of the area within the restrictive easement boundary is coastal plain (Mana Plain), coastal dunes, and cliffs. The ma ority of the terrain within this area is relatively flat, except for the coastal dunes found in Polihale State Park and PMRF, and the cliffs along the eastern boundary. The elevation within the region of influence ranges from sea level to . m (2 ft) within the coastal plain, to coastal dunes reaching elevations of 3 . m (1 ft), and then to the cliffs reaching elevations of 2 m (8 ft).

Within the restrictive easement boundary, the dunes in Polihale State Park are the most outstanding feature. Views from this area include the Pacific Ocean to the west and the sea cliffs of the Napali Coast to the north. The dunes have been designated by Kauai County as a Scenic Ecological Area because of their native vegetation and visibility in an otherwise flat landscape. The ma ority of the area within the restrictive easement boundary consists of the Mana Plain, which is used for the farming of sugar cane and, depending on the time of year, can consist of dirt fields or sugar cane in various stages of growth. Individual sugar cane fields are usually bordered by dirt roads and drainage channels. Along the eastern edge of the restrictive easement boundary are cliffs that rise from the Mana Plain. Because most of the region of influence historically has been used for agricultural purposes, little construction has taken place, and there are no public structures within the restrictive easement boundary. However, the area does have no-trespassing signs in the cane fields and swimming hazard signs in Polihale State Park.

3.1.2.13 Water Resources— Restrictive Easement (Ground Hazard Area)

3.1.2.13.1 Region of Influence

The region of influence includes the restrictive easement, including the Mana Plain and the ground hazard area.

3.1.2.13.2 Affected Environment

3.1.2.13.2.1 Surface Water

Surface water in the area of the restrictive easement on the Mana Plain is restricted to drains and agricultural irrigation ponds. Within the restrictive easement boundary, the surface water and storm water runoff drain onto Amfac Sugar-Kauai lands and agricultural ponds below the Mana cliffs. The Mana Plain is drained by canals that flow seaward. Typically, the water from the canals that drain from the sugar cane fields is brackish.
(U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-) 13

The waters in the agricultural ponds along the Mana cliffs generally do not meet drinking water standards for chloride salts but are near neutral to slightly alkaline (see table 3.1.1.1 -1, figure 3.1.1.1 -1). The highest chloride salt levels, near that of seawater, were observed in water from the Mana Pond Wildlife Sanctuary near the north gate of the PMRF. This may be due to the infiltration of brackish to saline groundwater into the pond basin or excessive evaporation to a low surface level. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-) 13

3.1.2.13.2.2 Groundwater

The aquifers are described in section 3.1.1.1 .2.

The groundwater beneath the restrictive easement increases in salinity from the base of the Mana cliffs to the Pacific Ocean. To keep the groundwater table below the root zone of the sugar cane, thousands of feet of canal have been excavated to drain excess water from the soil. The water is then pumped into canals such as the Nohili Ditch for release into the ocean. (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3- through 3-8) 13

3.1.3 MAKAHA RIDGE

Makaha Ridge, a secondary operations area for PMRF, is about 11 km (mi) north of PMRF/Main Base. This   -ha (2   . -ac) complex is located approximately at the   88-m (1,   -ft) elevation of Makaha Ridge and is leased from the State of Hawaii (see figure 2.3. -). Its primary mission in support of PMRF is to provide facilities for range operations at PMRF.

All Navy-controlled land at Makaha Ridge is reserved for range operations. The complex consists of tracking radars, antennas, communications, electronic warfare simulation, target command control, telemetry facilities, and a standby power plant. Data, communications, and command control commands are sent to and from PMRF/Main Base via a microwave system.

3.1.3.1 Air Quality—Makaha Ridge

See section 3.1.1.1 for a description or air quality as presented in this analysis.

3.1.3.1.1 Region of Influence

The region of influence is the Makaha Ridge.

3.1.3.1.2 Affected Environment

See section 3.1.1.1.2 for a description of regional air quality on Kauai. The only air pollutant emissions at Makaha Ridge are from diesel generators. These generators are permitted by the State of Hawaii.

3.1.3.2 Airspace—Makaha Ridge

See section 3.1.1.2 for a detailed discussion of the airspace environment forMakaha Ridge.

3.1.3.2.1 Region of Influence

The airspace region of influence for Makaha Ridge includes the site and the surrounding areas affected by radar operations.

3.1.3.2.2 Affected Environment

See section 3.1.1.2.2 for a discussion of the airspace affected environment atMakaha Ridge.

3.1.3.3 Biological Resources—Makaha Ridge

3.1.3.3.1 Region of Influence

The region of influence for biological resources encompassesMakaha Ridge and limited ad acent areas.

3.1.3.3.2 Affected Environment

3.1.3.3.2.1 Vegetation

A botanical survey was conducted at Makaha Ridge in December 1 2 as part of the Mountain Top Sensor Integration and Test Program. Vegetation at the sites is dominated by introduced non-native species. No rare, Federal or State candidate, or Federal or State proposed threatened and endangered plant species were found. Well-maintained grassy lawns and landscape plantings are located around the existing buildings. A few shrubs of the native false sandalwood or naio (*Myoporum sandwicense*) and the introduced lantana (*Lantana camara*) occur along the makai (coastal) edge of the Makaha Ridge complex. (U.S. Department of the Navy, 1 3, Dec, p. -1 through -11) 1

3.1.3.3.2.2 Wildlife

A wildlife survey conducted in December 1 2 noted six bird species, including three endemic species, the white-tailed tropicbird (*Phaethon lepturus*), the Pacific golden plover (*Pluvialis fulva*), and the common amakahi (*Hemignathus virens*). The golden plover is a migratory native bird, and the tropicbird is a native seabird. Three species of introduced birds commonly found in this area of Kauai were observed during the survey: spotted dove (*Streptopelia chinensis*), zebra dove (*Geopelia striata*), and the common myna (*Acridotheres tristis*). In addition, two native species that may occur in the area are the short-eared owl (*Asio flammeus sandwicense*) and the I iwi (*Vestiaria coccinea*). (U.S. Department of the Navy, 1 3, Dec, p. -11) 1

Although no evidence of mice or rats was observed, it is likely that these mammals inhabit the Makaha Ridge area. Feral goats (*Capra hircus*) were also seen in this general area. (U.S. Department of the Navy, 1 3, Dec, p. -11) 1

3.1.3.3.2.3 Threatened and Endangered Species

The Federal threatened Newell s shearwater ~~(*Puffinus newelli*)~~ was not observed during the survey, but may fly over the site while foraging. In addition, the Federal and State endangered Hawaiian goose, or *ne ne*, (*Nesochen sandvincensis*) occurs as a breeding population within the Makaha Ridge facility.

3.1.3.4 Cultural Resources—Makaha Ridge

Previous cultural resources inventory surveys conducted for the Makaha Ridge area have indicated that it consists of a built environment and that no historic sites were identified (U.S. Department of the Navy, 1 , Aug, p. 3 U.S. Department of the Navy, 1 3, Dec, p. -12, - 1
12, Appendix D, p.ii, p.13, Appendix I). 1

3.1.3.4.1 Region of Influence

The region of influence is the area of Makaha Ridge that is under the administrative urisdiction of PMRF.

3.1.3.4.2 Affected Environment

A cursory inspection for cultural resources within the Makaha Ridge area conducted for this
EIS indicated that it is a "built environment" and that all the extant level areas within this
property have been graded, improved, paved, or otherwise developed. No cultural
resources are noted for the Makaha Ridge area in the Cultural Resources Management
Overview Survey for PMRF. The layout of buildings at Makaha Ridge is constrained by
narrow ridges and steep slopes. Most buildings are situated at the ridge's terminus. The
structures are set at various angles along the existing ridge road. A secondary road leads
to a helicopter pad on an adjacent ridge (U.S. Department of the Navy, 1996, Aug, p.7). 167

3.1.3.4.2.1 Archaeological Resources (Prehistoric and Historic)

Previous cultural resources documentation for Makaha Ridge has indicated a lack of either
prehistoric or historic cultural resources for this area (U.S. Department of the Navy, 1996, 167
Aug, p.63; U.S. Department of the Navy, 1993, Dec, p.4-12, p.5-12; Appendix D, p.ii, 165
p.13; Appendix I).

3.1.3.4.2.2 Historic Buildings and Structures

It should be noted that existing buildings and structures within Makaha Ridge related to defense operations carried out during the Cold War could be considered potentially significant, particularly if they possess unique engineering features or capabilities.

Since the preparation of the Navy's Cultural Resources Management Overview Survey for
PMRF, a Phase I historic resources survey has been conducted for the installation which
includes the facilities Cold War properties. PMRF also has prepared a cultural resources
management plan (U.S. Department of the Navy, 1996, Aug, p.i). Finalization of a ICRMP 167
plan is expected by the middle of 1998 (Inouye, 1997, 5 Sep). 38

3.1.3.4.2.3 Traditional Resources

The current project area is situated in the upland forested region (Wao Nahele) of Waimea.
This area was not traditionally favored for long-term habitation, although traditional and
historic accounts document human activities in the region during ancient times. Sites in
the uplands were visited for ceremonial functions. Important pathways provided cross-
island and resource access to these upland areas. Forest resource harvesting also took
place in this area. This included utilization of wood for canoe making and other wooden
items, feathers for ornaments, and medicinal items. Archaeological features at Puukapele,
the Waimea Canyon overlook, and Halemanu confirm the use of the upland regions as well
(U.S. Department of the Navy, 1993, Dec, Appendix D, p.ii, p.13). The Indices of Awards 165
(for the project area) have not yielded any information pertaining to land use at this
location during the period of the Land Commission Awards action from 1848 to 1855.
Less than 12,141 ha (30,000 ac) were awarded by the Monarchy to native Kauaian
tenants as kuleana land throughout the island. In order to claim any land, the claimant had
to testify as to occupation of the land. It is unlikely that any permanent occupation of the
upper montane area occurred. As previously discussed, the upper regions of the island
were linked by pathways, and forest resources were exploited. It is possible that hale papi
(temporary shelters) would have been established along trails and at sites where specific

resources would have been regularly collected (U.S. Department of the Navy, 1 3, Dec, Appendix A, p.A-3). 1

3.1.3.5 Geology and Soils—Makaha Ridge

Geology and soils are considered earth resources that may be adversely affected by proposed activities. This resource is described in terms of existing information on the land forms, geology, and associated soil development as it may be sub ect to erosion, flooding, mass wasting, mineral resource consumption, contamination, and alternative land uses resulting from proposed construction and/or launch activities.

3.1.3.5.1 Region of Influence

The region of influence for geology and soils is the land within Makaha Ridge, specifically those areas directly disturbed by new construction of radar, telemetry, optics, command and control instrumentation, and a new helicopter pad.

3.1.3.5.2 Affected Environment

3.1.3.5.2.1 Physiography

The Makaha Ridge operations area is located in the Na Pali Cliff and Valley physiographic division of Kauai, an area characterized by high volcanic uplands, segmented by deeply incised V-cut valleys and bounded by exceptionally steep coastal cliffs (University of Hawaii, 1 83, p.38). The Makaha Ridge facilities are situated near the coast at the western edge of Makaha 1
Ridge, bounded on the west and north by precipitous cliffs attaining 2 . m (1, ft) in height and slopes as great as 18 percent (2 percent being vertical). Elevations at the facility range from 8. m (1,8 ft) at the eastern boundary to 2 . m (1, ft) at the cliff edge. Terrain changes abruptly across the site, but slopes are predominantly west to southwesterly, typically ranging from 8 to percent. Access to the site is attained by a steep and winding road that traverses densely vegetated forests along Makaha Ridge.

3.1.3.5.2.2 Geology

The Island of Kauai is the result of a massive shield volcano, part of the chain of similar volcanoes that migrated northwest to southeast to form the Hawaiian archipelago. Kauai is the oldest of the eight main islands. Volcanic rocks exposed in the western half of the island are composed of Pliocene basaltic flows of the Waimea Volcanic Series, which is further broken down into the following units: the Na Pali Formation, the Olokele Formation, the Haupu Formation, and the Makaweli Formation (Office of Naval Research, 1 , Apr, p. -1). One of a 8
series of prominent ridges which descend from the central highlands directly to the sea is Makaha Ridge, which is part of the Na Pali Formation, a thick sequence of olivine rich basaltic flows (U.S. Department of the Navy, 1 3, Dec, p.D-3). See section 3.1.1. .3 for a discussion 1
of volcanic activity and earthquakes on Kauai.

3.1.3.5.2.3 Soils

The soils that underlie the Makaha Ridge are in the Makaweli-Waiawa-Niu Association. This association consists of deep, gently sloping to steep, well-drained soils that have moderately fine- to fine-textured subsoil and shallow, steep and very steep, well-drained soils over basaltic bedrock. Found on uplands, these soils developed in material weathered from basic igneous rock, making up about percent of the island proper. Parts of Makaha Ridge have experienced severe soil erosion in the past, which is negatively impacting the coral reef below, due to the increase in turbidity and loss of light.

3.1.3.6 Hazardous Materials and Hazardous Waste—Makaha Ridge

3.1.3.6.1 Region of Influence

The region of influence encompasses the area within the property boundaries of Makaha Ridge.

3.1.3.6.2 Affected Environment

Hazardous materials and hazardous waste activities at Makaha Ridge are included in PMRF management plans for these types of materials. Daily activities are in accordance with those plans and similar operations described in section 3.1.1. .2 for PMRF/Main Base.

Makaha Ridge uses PMRF s pharmacy system, the Navy s CHRIMP, to obtain any needed hazardous materials for its operations. Makaha Ridge follows PMRF s hazardous materials management plans as described under PMRFINST 1 .2C, *Hazardous Material Control and Management Program*. The hazardous materials used at Makaha Ridge consist of lubricating oils and some minor amounts of solvents and are obtained from PMRF for 2-week periods. Each hazardous material storage area has appropriate Material Safety Data Sheets.

Hazardous waste at the facility is generated from minor maintenance activities associated with corrosion control, diesel generator overhauls, and regular radar maintenance. Diesel generators are overhauled after 1, hours of operation. Each overhaul generates one 2 8-L (-gal) drum of used oil, which is returned to PMRF for recycling.

Hydrostatic oil associated with the radar units is replaced every years and generates approximately 2 8.2 L (gal) of used oil.

There are two -kW generators and two 3 -kW generators supplied by two 22, 12-L (, -gal) diesel tanks and four 1,13 -L (3 -gal) day tanks. There is one 3, 8 -L (1, -gal) mogas tank and one 2 8-L (-gal) drum of motor oil. All tanks are above ground with appropriate containment devices. (Mattos, 1 , 1 Sep, p.1) 3

Pesticide use at Makaha Ridge is applied by the certified applicator from PMRF. There are no radon issues at the site, and ordnance is not stored at Makaha Ridge. No medical or radioactive wastes are generated, and there are no IRP sites at Makaha Ridge. Lead-based paint management and asbestos management at Makaha Ridge follow the same procedures as described for PMRF/Main Base. (Mattos, 1 , 1 Sep, p.1) 3

There are no PCB-containing transformers at Makaha Ridge. Makaha Ridge radar facilities do have capacitors and other components that contain PCBs. When such a part is no longer functional and requires disposal, the component is disposed according to PMRF s Hazardous Waste Management Plan. When a component suspected of containing PCBs needs to be disposed of, the manufacturer is called to determine if PCBs are actually present in the part. Disposal occurs according to the required procedures (Mattos, 1 , 1 Sep, p.1) 3

3.1.3.7 Health and Safety—Makaha Ridge

3.1.3.7.1 Region of Influence

The region of influence for health and safety of workers includes immediate work areas and EMR hazard areas. The region of influence for public safety includes areas bordering Makaha Ridge.

3.1.3.7.2 Affected Environment

Hazards to health and safety potentially occur as a result of EMR at the site. Hazards of EMR to personnel and fuel (called HERP and HERF, respectively) are the main concerns at Makaha Ridge. No ordnance is stored at the site, so there are no HERO issues. The helicopters that use the heliport at Makaha Ridge may have Electro-explosive Devices (EEDs) however, the area is below HERO unsafe levels due to sector blanking of the area. A radiation hazard survey conducted in 1 8 for PMRF including Makaha Ridge found no HERF issues and noted EMR levels from the AN/ALT- 2 (Building) exceed HERP hazard levels in an area 1. m (ft) from the AN/ALT- 2 where personnel operate the AN/DPT-1 s. HERP hazard levels were only exceeded when the AN/ALT- 2 is transmitting at less than 2 degrees. To correct this problem, a light and sign were posted warning when the AN/ALT- 2 is operating below 2 degrees (U.S. Department of the Navy, 1 , Oct, p.BB-2). To ensure conditions are safe, the 1
site is regularly surveyed for radiation hazards, and all systems have warning lights to inform personnel when radar units are operating. Because of Makaha Ridge s location at the end of a ridge, there are no health and safety issues associated with the public. As discussed under airspace, aircraft are warned through aeronautical charts of the potential EMR hazards associated with Makaha Ridge.

3.1.3.8 Land Use—Makaha Ridge

3.1.3.8.1 Region of Influence

The region of influence for land use encompasses the land within and surrounding Makaha Ridge.

3.1.3.8.2 Affected Environment

3.1.3.8.2.1 Land Use

Makaha Ridge consists of ha (2 . ac) of land leased from the State of Hawaii (U.S. Department of the Navy, 1 , Oct, p.C-1). The facility consists of tracking radars, antennas, 1
communication equipment, electronic warfare simulation, target command and

control, telemetry facilities, and a standby power plant. All Navy-controlled land at Makaha Ridge is reserved for range operations. The terrain, EMR hazards, and security concerns constrain other types of land use. (U.S. Department of the Navy, 1 3, Dec, p. -) None of 1
the safety zones affect offsite land use.

Makaha Ridge s location on the edge of a cliff limits any use of the land surrounding the site, with the general land use being open. The site is located within the Puu Ka Pele Forest Reserve. Current use of Makaha Ridge does not conflict with reserve management policies (Petteys, 1 , 2 Aug, p.1). According to the State Land Use Classification, Makaha Ridge is 8
within a conservation use district. No maps have been adopted by the county that include this area for land use or zoning. (U.S. Department of the Navy, 1 3, Dec, p. -) 1

3.1.3.8.2.2 Recreation

The only recreation area near Makaha Ridge is the Pine Forest Drive Picnic Area. This area is approximately 1. km (1 mi) from the site, with the picnic area being located . km (.2 mi) off of the main road to Makaha Ridge. The site consists of two picnic areas and an arboretum. The actual number of daily visitors to the site is unknown, but State officials indicate that the site is frequently occupied and is also used as a starting point for hunters (Petteys, 1 , 2
Aug, p.1). 8

3.1.3.9 Noise—Makaha Ridge

3.1.3.9.1 Region of Influence

The region of influence for noise is the Makaha Ridge property boundary.

3.1.3.9.2 Affected Environment

The existing noise environment is predominantly influenced by power plant generators and motor vehicle traffic moving along both Highway and Makaha Ridge Access Road. Due to the location of Makaha Ridge and the density of vegetation in the area, noise from vehicular traffic is not pronounced. (U.S. Department of the Navy, 1 3, Dec, p. -) The existing noise 1
environment at Makaha Ridge is considered quiet when the generators are not operating during range activities.

3.1.3.10 Transportation—Makaha Ridge

3.1.3.10.1 Region of Influence

The region of influence for transportation consists of the roadways that provide access to Makaha Ridge.

3.1.3.10.2 Affected Environment

Makaha Ridge is located at the western end of the Makaha Ridge Access Road (figure 3.1-1), approximately . km (mi) from its intersection with Highway in Kokee State Park in the vicinity of the 1 -mi marker. The access road is paved, two-lane, steeply sloped, and winds through a forested area. Driving distance between Waimea Town and

the turnoff for Makaha Ridge is approximately 22. km (1 mi). Driving distance on the access road is approximately . km (mi). (U.S. Department of the Navy, 1 3, Dec, p. - , -) 1
Existing traffic loads are generally light to moderate and primarily consist of tourists visiting Waimea Canyon and Kokee State Park.

3.1.3.11 Utilities—Makaha Ridge

3.1.3.11.1 Region of Influence

The region of influence for utilities includes systems that support theMakaha Ridge site. These systems include power supplied by Kauai Electric and water from the State Park.

3.1.3.11.2 Affected Environment

The utilities potentially affected by the capability enhancement program include power supply, potable (bottled) and non-potable water, wastewater treatment, and solid waste disposal.

3.1.3.11.2.1 Electricity

Recommendations from a Power System Study conducted to evaluate the existing Makaha Ridge electric system have recently been implemented. Electricity is provided to the Makaha Ridge by a 12. -kV line from Kauai Electric Company. The line enters the facility and supplies power with Kauai Electric Company-owned and maintained step-down transformers, and terminates at two 1,   -kVA low impedance step-down/step-up transformers at the facility power plant. Installations not served by the Kauai Electric line are served 8 V from the power plant that receives Kauai Electric power at 8 V from the transformers. One or more of the facility generators are synchronized onto the 8 -V system during mission operations. The facility currently has two   -kW and two 3 -kW diesel generators. Poles and overhead lines are in satisfactory condition. (U.S. Department of the Navy, 1   , p. , through 11) 1

3.1.3.11.2.2 Solid Waste

Refuse is collected and delivered to the county landfill atKekaha. (U.S. Army Program Executive Office, 1   , May, p.3-1) 12

3.1.3.11.2.3 Wastewater

Two cesspools and one septic tank/leach field system atMakaha Ridge provide disposal of sanitary wastewater. (U.S. Department of the Navy, 1 3, Dec, p. -1) 1

3.1.3.11.2.4 Water

Water is supplied to Makaha Ridge through a .2-km (. -mi) long, .1-cm (2-in.) pipeline that is connected to a State of Hawaii water main at Kokee State Park. Three Navy-operated tanks, with a total capacity of 28 ,   L (,   gal), provide water storage for the complex. Although water provided by the Navy is chlorinated prior to distribution, it is not potable. Bottled water is provided for consumption. Monthly bacteriological analyses are conducted by the State Department of Health. (U.S. Department of the Navy, 1 3, Dec, p. -1) 1

The current water use demand is approximately , L (2, gal) per day. State water is used for toilets and washing of vehicles, but not for radar operations. Currently, only one well supplies water at Kokee. The well is .1 m (3 ft) deep and has a capacity of approximately . L (2 gal) per minute. During the dry months of the summer, the groundwater table is below .1 m (3 ft), causing a water shortage in the system. Under these circumstances, sanitation water must be brought in. The State Park has implemented a mandatory water conservation program because current demand exceeds the capacity of the well. The park is drilling a new well that should be on-line within 1 to 2 years. This new well will have a capacity of 1 1 L (gal) per minute (218, 3 L , gal per day) and will have a depth of . m (1 ft). The Hawaii Department of Health has recommended that the old well be shut down because of sediment problems. (amada, 1 , 1 Sep, p.) 18

3.1.3.12 Visual and Aesthetic Resources—Makaha Ridge

3.1.3.12.1 Region of Influence

The region of influence for visual and aesthetic resources includes views within the boundaries of Makaha Ridge and the viewsheds that contain Makaha Ridge as an element of their composition.

3.1.3.12.2 Affected Environment

Makaha Ridge is extensively developed with radar and communication equipment and is~~on~~ one of many ridges north of PMRF that descends from the central highlands directly to the sea. The terrain is steep and the elevation changes abruptly. The elevation of the terrain varies from m (1, ft) to 3.8 m (1,8 ft). The site offers exceptional vistas to the ocean below, but the site itself is not visible from Highway in the immediate area and does not obstruct any prominent vistas. The site is visible from water craft traveling the ocean below and from a long distance on Highway on the Mana Plain near the PMRF Main Gate. (U.S. Department of the Navy, 1 3, Dec, p. -). In addition, hunters using the area in the Puu Ka Pele Forest 1
Preserve around Makaha Ridge may be able to see the facility along some of the ad acent bluffs. (Petteys, 1 , 2 Aug, p.1) 8

3.1.3.13 Water Resources—Makaha Ridge

3.1.3.13.1 Region of Influence

The region of influence for Makaha Ridge encompasses the water resources within and surrounding the facilities property boundaries.

3.1.3.13.2 Affected Environment

3.1.3.13.2.1 Surface Water

There are several drainages on and ad acent to the Makaha Ridge site. There are no perennial surface water features.

3.1.3.13.2.2 Groundwater

Groundwater occurs primarily in dike aquifers in the Na Pali formation. Currently, no groundwater resources are developed at Makaha Ridge.

3.1.4 KOKEE

Kokee is operated ointly by PMRF and NASA. It is located at an altitude of 1,13 .8 m (3, 1   ft) above mean sea level within Kokee State Park, which is owned by the State of Hawaii and managed by the DLNR, Division of State Parks (see figure 2.2.1-8).

The buildings and structures of Kokee were originally part of the Kokee Tracking Station operated by NASA. NASA holds the lease for the property from the State of Hawaii. The Navy operates facilities on the Kokee site as part of its range operations.

Kokee is made up of five parcels totaling   .3 ha (22.   ac), located almost in a straight line, with the extremities of the site being slightly less than a mile apart.

Parcel A (1. 3 ha 3.   ac) is the most southerly site and houses the Tracking and Command (T C) Building, the Training and Administration Building, and the Logistics Building. Facilities at Parcel A are occupied periodically on a temporary basis. Parcel A is surrounded by a cyclone fence, and the area in the vicinity of the T C Building has been graded and paved with asphalt. The ground elevation in the vicinity of the antenna tower is approximately 1,131 m (3, 1   ft) above mean sea level.

About   2 .   m (1,   ft) to the north, across Highway   , is Parcel B (. ha 1 ac), where a power plant and fuel storage area are located. Parcel C (.2 ha   .   ac), which is about   .2 m (1,   ft) farther north, includes the Boresight Equipment Building, the Facilities building, a microwave antenna and the unified S-band (USB) collimation radar/boresight tower. Parcel D (2.2 ha   .3 ac) is farther up-slope and contains the Spacecraft Antenna on Medium Pedestal (SCAMP) Transmitter Building and SCAMP antenna, and the AN/FPS-1   Radar Building. Parcel E (2.1 ha   .3 ac) is 2   .3 m (ft) farther north. Parcel E houses the USB building and antenna and the Spacecraft Automatic Tracking Antenna receiver antenna in whatis known as the Kokee Geophysical Observatory. Parcel E is also the site of the very long baseline interferometry (VLBI) facility, which is operated by NASA and the U.S. Naval Observatory. The balance of the Kokee parcels (2.   ha   .   ac) is composed of easements. (Office of Naval Research, 1   , Apr, p. -   through -) 8

3.1.4.1 Air Quality—Kokee

3.1.4.1.1 Region of Influence

The region of influence for air quality is an area within 1.   to 3.2 km (1to 2 mi) of the pollutant source.

3.1.4.1.2 Affected Environment

The regional climate and air quality at Kokee is similar to that presented in section 3.1.1.1.2. The only source of air pollutants at Kokee is the back-up diesel generators, which are permitted by the State of Hawaii.

3.1.4.2 Airspace—Kokee

3.1.4.2.1 Region of Influence

The airspace region of influence for Kokee includes the site and surrounding areas affected by radar operations.

3.1.4.2.2 Affected Environment

See section 3.1.1.2.2 for a discussion of the Kokee airspace affected environment.

3.1.4.3 Biological Resources—Kokee

3.1.4.3.1 Region of Influence

The region of influence for biological resources is the area within the fence surrounding the site.

3.1.4.3.2 Affected Environment

The region of influence for biological resources is the area within the fence surrounding the site.

3.1.4.3.2.1 Vegetation

A botanical assessment survey was conducted at Kokee in December 1 2. The vegetation on the site is dominated by non-native species. No listed, candidate, or proposed threatened and endangered plant species were found, nor were any of the plants found considered rare and vulnerable. The site is surrounded by forested areas that are a mixture of exotic species and some native trees and shrubs. The area under the existing .1-m (3 -ft) tower, as well as around the T C Building, is paved. (Office of Naval Research, 1 , Apr, p. -8 through -) 8

3.1.4.3.2.2 Wildlife

An avifauna and feral mammal survey was conducted at Kokee in December, 1 2. Two native bird species were observed at Kokee, the Pacific golden plover and the common amakahi (*Hemignathus virens*). The Pacific golden plover is a native migratory bird that prefers open areas such as mud flats, fields, and lawns. The amakahi is a native land bird. Neither of these birds is endangered or threatened.

Three species of exotic birds were observed at Kokee: the feral chicken (*Gallus gallus*), the common myna (*Acridotheres tristis*), and the Japanese white-eye (*Osterops japonicus*). These exotic birds are typical of those found in the region. In addition to these exotic species, the following birds may also occur at Kokee: the barn owl (*Tyto alba*), the white-rumped shama (*Copsychus malabaricus*), the Japanese bush-warbler (*Cettia diphone*), and the Eurasian skylark (*Alauda arvensis*).

No evidence of rats or mice was noted at the facility, but these ubiquitous mammals likely do occur on or near the site. There was evidence of feral pigs outside the fence line. Black-tailed deer (*Odocoileus hemionus*) occur in the Kokee area, but were not recorded on the survey. (Office of Naval Research, 1 , Apr, p. -8 through -) 8

3.1.4.3.2.3 Threatened and Endangered Species

The threatened Newell s shearwater may fly over the Kokee site.

3.1.4.4 Cultural Resources—Kokee

Previous cultural resources inventory surveys conducted for the Kokee area have indicated that it consists of a built environment and that no prehistoric or historic sites were identified (U.S. Department of the Navy, 1 , Aug, p. 3 U.S. Department of the Navy, 1 3, Dec, p. -18, - 1
, -12 Appendix D, p.1 , p.13 Appendix I). 1

3.1.4.4.1 Region of Influence

The region of influence is ~~the area of Kokee~~ within the property boundaries of Kokee. It is under the administrative urisdiction of PMRF.

3.1.4.4.2 Affected Environment

Kokee is made up of five parcels, located almost in a straight line, with extremities of the site being slightly less than a mile apart. It is situated on a ridge with steep slopes on either side. A cursory inspection for cultural resources within Kokee conducted for this EIS indicated that all the extant level areas within this property have been graded, improved, paved, or otherwise developed.

3.1.4.4.2.1 Archaeological Resources

Previous environmental documentation for the Kokee area has indicated a lack of prehistoric cultural resources (U.S. Department of the Navy, 1 , Aug, p. 3 U.S. Department of the 1
Navy, 1 3, Dec, p. -12, -12 Appendix D, p.ii, p.13 Appendix I). 1

3.1.4.4.2.2 Historic Resources

It should be noted that buildings and structures related to defense operations carried out during the Cold War could be considered potentially significant, particularly if they possess unique engineering features or capabilities.

Since the preparation of the Navy s Cultural Resources Management Overview Survey for PMRF, a Phase I historic resources survey has been conducted for the installation which includes the facilities Cold War properties. PMRF is currently preparing an ICRMP. Finalization of this ICRMP is expected in the middle of 1 8. (Inouye, 1 8, 28 Jan)

3.1.4.4.2.3 Traditional Resources

Traditional resources for Kokee are similar to those described for Makaha Ridge in section 3.1.3. .2.3.

3.1.4.5 Geology and Soils—Kokee

Geology and soils are considered earth resources that may be adversely affected by proposed activities. This resource is described in terms of existing information on the land forms, geology, and associated soil development as it may be sub ect to erosion, flooding, mass wasting, mineral resource consumption, contamination, and alternative land uses resulting from proposed construction and launch activities.

3.1.4.5.1 Region of Influence

The region of influence for geology and soils is the land within Kokee, specifically those areas directly disturbed by new construction of the proposed telemetry building and antenna, Multiple Ob ect Tracking Radar Site, and towers and platforms for communication equipment.

3.1.4.5.2 Affected Environment

3.1.4.5.2.1 Physiography

Kokee is located in the Puu Ka Pele Dissected Upland, a highly eroded volcanic terrain characterized by numerous ma or valleys and established master drainage patterns (University of Hawaii, 1 83, p.38). The site is situated on Kaunuohua Ridge, a north-northeast trending 1
ridge line which diverges from Highway near the northwestern terminus of Waimea Canyon. Elevations at the site range from 1,1 m (3, ft) in the northeast to 1,131 m (3, 1 ft) in the southwest, defining a gentle ridge line slope of approximately 3 percent southwesterly. Surface water runoff generally falls northwest/southeast due to more severe side slopes ranging from about 1 to percent.

3.1.4.5.2.2 Geology

The geology of Kokee is similar to that described for Makaha Ridge in section 3.1.3. .2.

3.1.4.5.2.3 Soils

Soils which underlay Kokee are of the Kokee series, characterized as well-drained soils on the uplands of the Island of Kauai. The soils have been developed from basic igneous rock, probably mixed with volcanic ash. They vary from gently sloping to very steep soils and are found between 1, 3 m (3, ft) and 1,28 m (,2 ft) above mean sea level (MSL). The specific soil type found at Kokee is the Kokee Silty Loam. The permeability of this soil is moderately rapid, runoff is medium, and the erosion hazard is slight to moderate. This soil is generally unsuited for cultivation (Office of Naval Research, 1 , Apr, p. -8). 8

3.1.4.6 Hazardous Materials and Hazardous Waste—Kokee

3.1.4.6.1 Region of Influence

The region of influence encompasses the property boundaries of Kokee.

3.1.4.6.2 Affected Environment

Hazardous materials and hazardous waste activities at Kokee are included in PMRF management plans for these types of materials. Daily activities are in accordance with those plans and similar operations described in section 3.1.1. .2 for PMRF/Main Base.

Kokee uses PMRF s pharmacy system, the Navy s CHRIMP, to obtain any needed hazardous materials for its operations. Kokee follows PMRF s hazardous materials management plans as described under PMRFINST 1 . The hazardous materials used at Kokee consist of lubricating oils and some minor amounts of solvents and are obtained from PMRF for 2-week periods. Each hazardous material storage area has appropriate MSDSs. (Mattos, 1 , 1
Sep, p.1) 3

Hazardous waste at the facility is generated from minor maintenance activities associated with corrosion control, diesel generator overhauls, and regular radar maintenance. Diesel generators are overhauled after 1, hours of operation. Each overhaul generates one 2 8-L (-gal) drum of used oil that is returned to PMRF for recycling. (Mattos, 1 , 1 Sep, p.1) 3

Hydrostatic oil associated with the radar units is replaced every years and generates approximately 2 8 L (gal) of used oil.

There are five generators at Kokee, two -kW, two 3 -kW, and one 2 -kW, with associated fuel tanks. There are two , 3 -L (2 , -gal) aboveground diesel tanks, and one 1,8 3-L (-gal) day tank. All tanks have the appropriate containment devices. (Mattos,
1 , 1 Sep, p.2) 3

Pesticide use at Kokee is applied by the certified applicator from PMRF (Mattos, 1 , 1 Sep,
p.1). There are no radon issues at the site, and ordnance is not stored at Kokee. No medical 3
or radioactive wastes are generated, and there are no IRP sites at Kokee. Lead-based paint management and asbestos management at Kokee follow the same procedures as described for PMRF/Main Base.

There are no PCB-containing transformers at Kokee. Kokee radar facilities do have capacitors and other components that contain PCBs. When such a part is no longer functional and requires disposal, the component is disposed according to PMRF s Hazardous Waste Management Plan. When a component suspected of containing PCBs needs to be disposed of, the manufacturer is called to determine if PCBs are actually present in the part. Disposal occurs according to the required procedures. (Mattos, 1 , 1 Sep, p.1) 3

3.1.4.7 Health and Safety—Kokee

3.1.4.7.1 Region of Influence

The region of influence for health and safety of workers includes immediate work areas and EMR hazard areas. The region of influence for public safety includes areas bordering Kokee.

3.1.4.7.2 Affected Environment

Hazards to health and safety potentially occur as a result of EMR at the site. Hazards of electromagnetic radiation to personnel and fuel (called HERP and HERF, respectively) are the main concerns at Kokee. No ordnance is stored at the site, so there are no HERO issues. The only fuel stored at the site (diesel fuel for the electrical generators) is located outside of any EMR generating areas, so there are no HERF issues at the site. Appropriate sector blanking and the elevation of the radar units above the ground have eliminated any potential HERP issues at Kokee. To ensure conditions are safe, the site is regularly surveyed for radiation hazards, and all systems have warning lights to inform personnel when the radar units are operating. The public is not exposed to any unsafe EMR levels.

As discussed under airspace, aircraft are warned through aeronautical charts of the potential EMR hazards associated with Kokee operations.

3.1.4.8 Land Use—Kokee

3.1.4.8.1 Region of Influence

The region of influence for land use encompasses the land within and surrounding Kokee.

3.1.4.8.2 Affected Environment

3.1.4.8.2.1 Land Use

Kokee consists of five parcels leased from the State of Hawaii (U.S. Department of the Navy, 1 3, Dec, p. -13). Kokee consists of tracking radars, telemetry, ultra high frequency/very high 1
frequency communications, and command and control systems. Kokee is situated within Kokee State Park, which is owned by the State of Hawaii and managed by the Department of Land and Natural Resources, Division of State Parks. The land use around the site is used for recreational purposes and consists of open land that is heavily vegetated. The main highway through the State Park runs parallel to the facilities. According to the State Land Use Classification, Kokee is within a conservation use district. No maps have been adopted by the county that include this area for land use or zoning (U.S. Department of the Navy, 1 3, Dec, p. -). None of the safety zones affect offsite land use. 1

3.1.4.8.2.2 Recreation

Kokee is within Kokee State Park, home of the Waimea Canyon one of the primary tourist destinations on Kauai. Many spectacular public viewing areas, including the Kalalau and Waimea Canyon Lookouts, are situated in the park, in addition to Kokee Lodge and

Museum (U.S. Department of the Navy, 1 3, Dec, p. -1). A hiking trail is located near the 1
Kokee facilities but is not affected by the operations.

3.1.4.9 Noise—Kokee

3.1.4.9.1 Region of Influence

The region of influence for noise is ~~contained~~ the area within the Kokee property boundary.

3.1.4.9.2 Affected Environment

The existing noise environments at Kokee result from operation of the electrical power generators at Parcel B (approximately 1,3 hours in 1) and from traffic on nearby Highway (Office of Naval Research, 1 , Apr, p. -). The existing noise environment at the Kokee 8
facility is considered quiet.

3.1.4.10 Transportation—Kokee

3.1.4.10.1 Region of Influence

The region of influence for transportation consists of the road network that provides access to and from Kokee.

3.1.4.10.2 Affected Environment

Kokee is reached via one of two routes off Kaumualii Highway, the main circulation route connecting west Kauai to Lihue. Highway , a State highway, is the primary circulation route linking Kokee State Park to Kaumualii Highway and Waimea (see figure 3.1~~.3.1~~-1). Kokee is between the 1 -mi marker and the 1 -mi marker on Highway . Ingress and egress to Parcel A are via an access road that branches off Highway . Highway has a posted speed limit of 2 mi per hour, with a paved width that varies between . and .1 m (18 and 2 ft). Average daily traffic in 1 was 1,3 vehicles along the 18.2-km (11.3-mi) section of Kokee Road from the intersection of Waimea Canyon Drive (Highway) north to the end of the entrance of Kalalau Lookout (figure 3.1~~.3.1~~-1). The second access route is via Kekaha on a County of Kauai road that intersects with State Highway about 11 km (mi) from Waimea. (Office of Naval Research, 1 , Apr, p. -) 8

3.1.4.11 Utilities—Kokee

3.1.4.11.1 Region of Influence

The region of influence for utilities is the western portion of the Island of Kauai.

3.1.4.11.2 Affected Environment

The utilities within western Kauai potentially affected by the capability enhancement program include the power supply, water, wastewater treatment, and solid waste disposal.

3.1.4.11.2.1 Electricity

Kokee obtains power from Kauai Electric Company s 12. kV feeder from the Waimea substation. The power is transmitted via a 12. -kV line that parallels Highway . Parcels A, C, D, and E are presently supplied power from the power plant located at Parcel B. The power plant can supply power from either Kauai Electric via a -kVA transformer or from any combination of its five diesel engine generators, with a total capacity of 1, kW. Kauai Electric supplies power to the power plant at 12. kV. It is then transformed to 8 V at the power plant and tied into the technical power and/or utility power distribution buses.

The power plant generators have an output of 8 V and are individually tied into the technical power and/or utility power distribution buses. Utility power is used for lighting, heating, air conditioning, etc. Technical power is used for electronic equipment, radar-related equipment, etc. The 8 V power is transformed to ,1 V for distribution to the various sites. At the sites, it is transformed down to 8 V or 2 8 V.

3.1.4.11.2.2 Solid Waste

Solid waste generated by Kokee is collected as an ongoing operation by the Navy and is disposed of in the county landfill at Kekaha.

3.1.4.11.2.3 Wastewater

Kokee is serviced by cesspools or septic tank/leach fields. All existing buildings at Parcel A rely on individual cesspool systems for sewage disposal. Cesspools servicing Parcel A are located west of the T C Building. These systems were installed prior to the adoption of State of Hawaii Department of Health regulations for private wastewater treatment works and individual wastewater systems. Historically, there have been no problems identified with the cesspools operations. Therefore, the reliance on cesspools to partially dispose of sanitary wastewater is adequate since they are exempted from the requirements of Chapter 2 of the State of Hawaii Department of Health regulations.

Under Chapter 23 of the State of Hawaii Department of Health regulations, the State Underground In ection Control program requires a permit and submission of data for sewage in ection wells. However, as stated in the regulations, non-residential waste disposal systems that receive solely sanitary wastes where the facility generates less than 1, gallons per day gpd are excluded from the requirements of Chapter 23. Based on the per capita sewage flow generation criteria established by *State Public Health Service Publication No. 526*, the 3, 8 L per day (1, gpd) translates to approximately persons based on L (1 gal) per capita per day. Because no individual cesspool system at the station serves more than persons per day, the permit and submission of data requirements of Chapter 23 are not applicable.
(Office of Naval Research, 1 , Apr, p. - through -8) 8

3.1.4.11.2.4 Water

Potable water is brought to Kokee by PMRF personnel and stored onsite. Non-potable water is provided by the State. When operations are being conducted at the Kokee PMRF site during the dry summer months, water demand exceeds capacity, which impacts State

Park operations. State Park personnel report that during high demand in the summer there is not enough water to operate park facilities. State-supplied water is used for toilets and washing vehicles but is not used for radar operations. Under these drought conditions, sanitation water must be brought in. The current demand for water use is 2, 3 L (8 gal) per day. A discussion of the water problems at Kokee is provided above in section 3.1.3.11.3. (Souza, 1 , Jul, p.1). 21

3.1.4.12 Visual and Aesthetic Resources—Kokee

3.1.4.12.1 Region of Influence

The region of influence for visual and aesthetic resources includes views within the boundaries of Kokee and the viewsheds that contain Kokee as an element of their composition.

3.1.4.12.2 Affected Environment

Kokee consists of radar units, buildings, and microwave towers. The site elevation varies from 1,131 m (3, 1 ft) to 1,1 m (3, ft) over a distance of approximately 1. km (1 mi). The topography both west and east of the site declines rapidly. Highway , which provides access to both facilities from Kaumualii Highway, extends about 2 km (18 mi) to the Kalalau Lookout and is characterized as a winding road that is flanked by dense stands of trees, especially at higher elevations. Visibility is often restricted, not only by the vegetation, but also by extreme changes in topography. Formal public lookouts offering spectacular vistas within Kokee State Park are the Waimea Canyon Lookout, the Puu Hinahina Lookout, the Kalalau Lookout, and the Puu O Kila Lookout. The general ambiance of the drive through the park is one of lush foliage with occasional glimpses of Waimea Canyon. Throughout this drive, which terminates at approximately the 18-mi marker at the Kalalau Lookout, overhead electrical wires and utility poles parallel the roadway. There are other reminders of the built environment. At approximately the -mi marker, there is a microwave dish antenna that is approximately 3 . m (1 ft) high and clearly visible as it is approached from a downhill direction.

Between the 1 -mi and 1 -mi markers, two antennas, one a 2 -m (8 -ft) collimation tower for the USB receiving dish at the Kokee Geophysical Observatory and the second a . -m (1 -ft) microwave antenna operated for PMRF, are clearly visible as they extend beyond the tree line. No other structures of Kokee site are visible from the highway as one travels uphill, including those at Parcel A.

On the return drive toward Waimea, the USB receiving dish antenna is only occasionally visible through the trees between the 1 -mi and 1 -mi markers, as it extends above the tree line. It is most visible on the downhill approach to the Kokee Lodge for a lineal distance of about 1 m (3 ft). In addition, the Very Long Baseline Interferometry (VLBI) radio telescope at Kokee Geophysical Observatory is also visible along this portion of Highway . None of the facilities at Kokee are visible from the Waimea Canyon, Puu Hinahina, Kalalau, or Puu O Kila Lookouts within Kokee State Park.

After proceeding past the Kokee Lodge, the next visible development is the existing antenna pedestal at Kokee Parcel A. The pedestal is visible for a length of about 1 m

(3 ft) along Highway between the 1 -mi and 1 -mi markers, traveling in a downhill direction. When installed for a particular operation, the antenna protrudes above the tree line. Existing electric utility poles and lines are also prominent visual features of the landscape along this stretch of Highway . (Office of Naval Research, 1 , Apr, p. -2) 8

3.1.4.13 Water Resources—Kokee

3.1.4.13.1 Region of Influence

The region of influence for Kokee includes the water resources in and surrounding its property boundaries.

3.1.4.13.2 Affected Environment

3.1.4.13.2.1 Surface Water

There are no perennial surface water features at the Kokee site.

3.1.4.13.2.2 Groundwater

Groundwater resources are expected to be similar to those described for Makaha Ridge in section 3.1.3.13.2.

3.1.5 KAMOKALA MAGAZINES

The Kamokala Magazines are used by PMRF for storage of ordnance material. This magazine area for the station is located at Kamokala Ridge, approximately 3.2 km (2 mi) east of the Main Gate (see figure ~~2.2.1-~~ 3.1-8). The magazines are in continuous use by PMRF, the Hawaii Air National Guard, and the DOE. Other commands conducting exercises and needing storage are also accommodated intermittently. The Navy leases 3 .2 ha (. ac) from the State for the ordnance material storage magazines.

3.1.5.1 Air Quality—Kamokala Magazines

3.1.5.1.1 Region of Influence

The region of influence for air quality resources is the Mana Plain.

3.1.5.1.2 Affected Environment

The existing air quality in the region of the Kamokala Magazines is in attainment for all USEPA and State of Hawaii criteria pollutants. Fugitive dust during field preparation and smoke during the sugar cane burning process have short-term effects on airborne particulate levels. These agricultural activities do not result in deterioration of the air quality of the region.

3.1.5.2 Biological Resources—Kamokala Magazines

3.1.5.2.1 Region of Influence

The region of influence for biological resources includes the Mana Plain and ad acent cliffs.

3.1.5.2.2 Affected Environment

The dominant vegetation in the area to be disturbed by construction of additional facilities at the Kamokala Magazines is a kiawe/koa haole shrub association, with ruderal vegetation along the roadsides. The kiawe/koa haole association dominates the area between the cliffs and the sugar cane fields to the west. The proposed Kamokala Magazines expansion area appears to have been disturbed in the past with the kiawe/koa haole association occurring as successional vegetation to what may have been agricultural fields prior to the implementation of the existing ESQD around the weapons storage area. Wetlands are associated with the drains and farm ponds along the cliff front and throughout the Mana Plain. There is a drainage ditch that appears to traverse a portion of the area to be included in the proposed Kamokala Magazines facilities expansion and the expanded ESQDs. The wildlife using this area is similar to that described for the PMRF/Main Base and restrictive easement sections of this document (sections 3.1.1.3 and 3.1.2.2).

3.1.5.3 Cultural Resources—Kamokala Magazines

A discussion of cultural resources applicable to the Kamokala Magazines Area can be found in section 3.1.1. ~~1~~.

3.1.5.3.1 Region of Influence

The region of influence for cultural resources includes the cliffs and the Mana Plain immediately ad acent to the Kamokala Magazines.

3.1.5.3.2 Affected Environment

3.1.5.3.2.1 Archaeological Resources

The Kamokala Magazines area has the potential to contain significant archaeological resources. Undocumented traditional Hawaiian agricultural features (alignments and possible water diversions) have been observed in the Kamokala Magazines area (U.S. Department of the Navy, 1 , Aug, p. 3). This area is located within a zone of known pre-contact settlement. 1
It has a high potential for habitation sites and burial features as indicated by the presence of these site types in the foothills ad acent to it (U.S. Department of the Navy, 1 , Aug, p. 3). 1

The area immediately south of the Kamokala Magazines area may contain cultural resources, but has not been systematically surveyed due to environmental constraints in that area. A cursory reconnaissance of this locale indicates that it is in an extensive waste disposal site, which appears to have been in use from the 1 s to the present.

3.1.5.3.2.2 Historic Resources

The ordnance magazines, which were constructed during World War II, may be considered significant historic military assets, which are potentially eligible for listing in the National Register (Inouye, 1 8, 3 Feb). The 1 magazines excavated into the hillside along the Kamokala Ridge are still used for storing various weapons materials. They are not cut directly into the hillside, but are excavated with offset entrances. The tunnels are semi-cylindrical with a diameter of approximately 3 m (.8 ft). They vary in length from approximately   to 2 m (21 to   ft). The excavated rock walls and concrete floors have been sprayed with gunnite. Their entrances are closed by double metal doors surrounded by concrete. The placement of the magazines at a distance from the main base may have been indicative of the expectation of further attacks on Hawaii after Pearl Harbor. The utilization of pre-existing excavated spaces rather than building concrete magazines (such as those at NAS Barbers Point) may be indicative of war time material shortages. These ordnance magazines represent a distinctive type of construction and are associated with the overall buildup of the base on Kauai during World War II. (U.S. Department of the Navy, 1   , Aug, p. 3, p. 2). 1

Since the preparation of the Navy s Cultural Resources Management Overview Survey for PMRF, a Phase I archaeological survey of unsurveyed areas, and a historic resources (which includes the facilities Cold War properties) has also been conducted. PMRF also has prepared a cultural resources management plan (U.S. Department of the Navy, 1   , Aug, p.i). An 1
ICRMP for PMRF is currently being developed (Inouye, 1 8, 28 Jan).

3.1.5.3.2.3 Traditional Resources

The Kamokala Magazines area is situated within a region of Mana specifically known as *leina-a-ka-uhane*, a place (generally cliffs and seacoast promontories) where the spirits of the dead would plunge into eternity and enter the spiritual realm. Burial sites believed to be associated with the Mana area s *leina-a-ka-uhane* have been identified throughout the cliffs in this region (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1 through 3-1). To date, 13
Kauai archaeologists and elders have indicated that the leina-a-ka-uhane are not in the area of the Kamokala Magazines.

3.1.5.4 Geology and Soils—Kamokala Magazines

Geology and soils are considered earth resources that may be adversely affected by proposed activities. This resource is described in terms of existing information on the land forms, geology, and associated soil development as it may be sub ect to erosion, flooding, mass wasting, mineral resource consumption, contamination, and alternative land uses resulting from proposed construction and launch activities.

3.1.5.4.1 Region of Influence

The region of influence for geology and soils is the land within Kamokala Magazines, specifically those areas directly disturbed by new construction of two missile storage buildings and associated fencing.

3.1.5.4.2 Affected Environment

3.1.5.4.2.1 Physiography

The Kamokala Magazines are located at the western edge of the Puu Ka Pele Dissected Upland, a highly eroded volcanic terrain characterized by numerous ma or valleys with established master drainage patterns (University of Hawaii, 1 83, p.38). The volcanic terrain 1
has been truncated by an ancient and higher stand of the sea that carved cliffs, less prominent, but similar in structure and alignment as the Na Pali Coast. The ancient sea cliffs now form the back scarp to the eastern edge of the Mana Plain. The Kamokala Magazines have been excavated into the steep cliff walls at the end of the narrow Kamokala Ridge, directly east of the PMRF/Main Base entrance. A service road connects numerous magazine storage areas at elevations of 3.2 m (2 ft) to . m (32 ft). Surface water drains north and south into bounding ephemeral stream channels of Nahomalu Valley and Kaawaloa Valley, respectively, or westerly onto the Mana Plain.

3.1.5.4.2.2 Geology

The geology at Kamokala Magazines is similar to that described for Makaha Ridge in section 3.1.3~~1~~. .2.

3.1.5.4.2.3 Soils

The new construction of the Kamokala Magazine ordnance storage buildings and security fencing will be on soils mapped as Kekaha silty clay, 2 to percent slopes (U.S. Department of Agriculture, 1 2, Aug, p.). These soils are developed on elevated alluvial fans of the Mana 1
Plain. During site reconnaissance, the area was noted as being locally stony (volcanic boulder rubble). Runoff is medium and erosion hazard is slight to moderate. The area is currently not irrigated and forms a transition between the irrigated sugar cane lands and the extremely stony silty clay loam, to 3 percent slopes, that coalesce at the base of Nahomalu Valley.

3.1.5.5 Hazardous Materials and Hazardous Wastes—Kamokala Magazines

3.1.5.5.1 Region of Influence

The region of influence encompasses area within the property boundaries of the Kamokala Magazines and associated ESQD.

3.1.5.5.2 Affected Environment

Hazardous materials and hazardous waste activities at Kamokala Magazines are included in PMRF management plans for these types of materials. Daily activities are in accordance with those plans and similar operations described in section 3.1.1. .2 for PMRF/Main Base.

No hazardous materials are used or hazardous waste generated from activities at the Kamokala Magazines. There are no storage tanks or known IRP sites at this location. The gunnite material lining the caves has not been tested for asbestos, and therefore, must be presumed to be an asbestos-containing material. The site does not have any PCB-containing material or radon issues.

A survey of the proposed magazine construction area conducted in November 1 noted that the site has been used as an illegal surfacedump site. Wastes noted included abandoned automobiles, rusty 2 8-L (-gal) drums, household cleaners and waste, oil filters, and various household appliances. Material found in the site dates fromthe mid 1 s to the present. The site may have been used by residents who live in nearby areas. Theland is currently owned by the State of Hawaii.

The magazines are a secured area controlled by the PMRF Ordnance Office, Code 331. (U.S. Department of Defense, 1 1, Sep, p.8) The warheads, ordnance, and solid rocket motors 1 8
used in training exercises at PMRF are stored in theKamokala Magazines. When needed, they are transported to the launch or loading site. All explosive ordnance, including solid rocket motors, are handled in accordance with NAVSEA OP , Volume 1.

3.1.5.6 Health and Safety—Kamokala Magazines

3.1.5.6.1 Region of Influence

The region of influence for health and safety consists of the immediate work areas and ordnance hazard areas. The region of influence for public safety includes theKamokala Magazines, Mana Plain, and the ESQD not within the surrounding cliffs. (U.S. Army Program Executive Office, 1 , May, p.3-13) 12

3.1.5.6.2 Affected Environment

The health and safety issues for theKamokala Magazines are associated with the transfer and storage of ordnance (such as missiles). No more than 13, 8 kg (3 , lb) net explosive weight can be stored at each magazine cave this generates a safety area with a 1 .3-m (2,3 -ft) radius in a -degree arc to the front of each 13, 8kg (3 , -lb) net explosive weight tunnel, diminishing in radius by 3 -degree increments away from the front. (U.S. Department of the Navy, 1 , Oct, p.D-21) (see figure 3.1.1. -1). Storage of ordnance is 1
conducted in accordance with DOD and Navy standards. In addition, PMRF has established instruction 8 23.G, which details how the storage and handling of ordnance is conducted.

3.1.5.7 Land Use—Kamokala Magazines

3.1.5.7.1 Region of Influence

The region of influence for land use includes theMana Plain, Kamokala Ridge, and the surrounding cliffs. The cliffs are undeveloped and virtually inaccessible.

3.1.5.7.2 Affected Environment

3.1.5.7.2.1 Land Use

Kamokala Magazines storage magazine consists of 3 .2 ha (. ac) of land leased from the State of Hawaii. The ESQD arcs for this storage area encompass land owned by the State of Hawaii and leased to Amfac Sugar-Kauai for the production of sugar. ~~Some of the are Home Lands~~. Hawaiian ~~Home Lands are areas set aside for the State to lease residential, farm, and pastoral homestead lots for 1 per year to native Hawaiians~~. The foreseeable uses of the Hawaiian home lands within the ESQD arc are consistentwith explosive safety criteria.

The dominant land use in the area within the ESQD arcs and surrounding the Navy leased area is either sugar cane production or open land (see figure 3.1.1.83–). Open land, ~~is~~ associated with the steep cliffs where the storage magazine is located, ~~that~~ cannot be developed and is in front of the storage areas.

According to the State Land Use Classification, theKamokala Magazines are within an agricultural land use district. The land is zoned open in theWaimea-Kekaha Regional Plan and Kauai General Plan.

3.1.5.7.2.2 Recreation

There are no recreation resources ad acent to theKamokala Magazines. However, some limited hunting occurs in the surrounding areas.

3.1.5.8 Transportation—Kamokala Magazines

3.1.5.8.1 Region of Influence

The region of influence for transportation encompasses State Highway , along with sugar cane haul roads and other dirt roads ad acent to theKamokala Magazines.

3.1.5.8.2 Affected Environment

Transportation in the area ad acent to theKamokala Magazines is restricted to graded sugar cane haul roads and other smaller farm roads along canals and drains. Some of these roads provide a connection to State Highway betweenPolihale State Park and Kekaha. Transportation of hazardous materials is governed by Federal and State regulations.

3.1.5.9 Visual and Aesthetic Resources—Kamokala Magazines

3.1.5.9.1 Region of Influence

The region of influence is the Kamokala Magazines and surrounding Mana Plain.

3.1.5.9.2 Affected Environment

The physical setting of the area is of coastal plain (Mana Plain), coastal dunes, and cliffs. The ma ority of the terrain within this area is relatively flat, except for the coastal dunes found in Polihale State Park and PMRF and the cliffs where the storage magazine is located. The elevation within the region of influence ranges from sea level to . m (2 ft) within the coastal plain, to coastal dunes reaching elevations of 3 . m (1 ft), and then to the cliffs reaching elevations of 2 m (8 ft).

The main public road through the area, which provides access toPolihale State Park, passes west of the storage magazine through sugar cane fields. The vegetation in front of the magazine area, the distance from the main public road (2. km 1. mi), and the way the storage tunnels are constructed into the cliffs effectively limit any public views of the storage magazines. The only visible evidence of storage magazines is a fence and hazard sign posted at the entrance on the dead end road that leads to the facility. The storage magazines do not obstruct any prominent vistas of the area.

3.1.5.10 Water Resources—Kamokala Magazines

3.1.5.10.1 Region of Influence

The region of influence includes the water resources surrounding the immediate vicinity of Kamokala Magazines.

3.1.5.10.2 Affected Environment

3.1.5.10.2.1 Surface Water

Surface water associated with Kamokala Magazines includes drainages that run ad acent to the northern and southern property boundary lines.

3.1.5.10.2.2 Groundwater

See section 3.1.2.13.2 for a description of groundwater resources. The edge of the Mana Plain is coincident with the western boundary of the Kamokala Magazines site.

3.1.6 PORT ALLEN

Port Allen is a small, fully developed industrial seaport located on the south central coast of Kauai, approximately 2   km (1   mi) southeast from PMRF (see figure 3.1-1). The site consists of   .3 ha (.   ac) of pier and warehouse space leased from the State of Hawaii and a private company. Port Allen is currently used by PMRF to operate target/torpedo retrievers and target boats by approximately 13 Navy and 1   subcontractor personnel. (U.S. Army Strategic Defense Command, 1   2, Feb, p.3-   ) 13

3.1.6.1 Air Quality— Port Allen

3.1.6.1.1 Region of Influence

The region of influence for air quality is limited to an area within approximately 1.   to 3.2 km (1 to 2 mi) of the pollution source.

3.1.6.1.2 Affected Environment

The climate of Port Allen is similar to that described for PMRF/Main Base in section 3.1.1.1.2.

Port Allen is in attainment for all National and State AAQS. It has a low level of industry and probably has emissions similar to those found in a light industrial park.

The surface craft maintenance and support apparatus generates low levels of various Volatile Organic Compound (VOC) emissions.

3.1.6.2 Hazardous Materials and Hazardous Waste— Port Allen

3.1.6.2.1 Region of Influence

The region of influence for Port Allen encompasses the pier and warehouse for the target-towing ships and a warehouse for SEPTAR repair along with an associated storage yard.

3.1.6.2.2 Affected Environment

Hazardous materials and hazardous waste activities at Port Allen are included in PMRF management plans ~~for these types of materials~~. Daily activities are in accordance with those plans and similar operations described in section 3.1.1. .2 for PMRF/Main Base.

Activities at Port Allen use PMRF s pharmacy system, the Navy s CHRIMP, to obtain any needed hazardous materials for its operations except for specialty items required in the repair of the SEPTARS (e.g., fiberglass resin). Port Allen follows PMRF s hazardous materials management plans as described under PMRFINST 1 .2C. (Nesbitt, 1 , 1 Sep, p.1)

Surface targets support vehicles, SEPTARs, are maintained and operated by Navy personnel at Port Allen. (Brennan, 1 , 18 Dec, p.1) PMRF towed targets are ~~also~~ maintained and 11
serviced at this location as well. Hazardous materials used at the site include acetone, thinner, resins, enamels, batteries, motor oil, transmission fluid, and fuel. Fuel is provided for the boats by a private contractor to the Navy fuel trucks. In F , the range boats consumed 8 ,238 L (12 ,8 gal) of diesel fuel. (Nesbitt, 1 , 18 Dec, p.1). PMRF maintains emergency spill response equipment at the site to control any hazardous materials spills until the PMRF/Main Base Hazardous Materials Response Team can arrive. PMRF practices emergency spill response at the site once a quarter.

Port Allen generates ~~waste~~ used oil, paint wastes (non-lead-based paint), resin, oily rags, and oily bilge water as a result from current PMRF activities on the premises. The oily bilge water is processed through an oil/water purification unit at PMRF, and waste oil is recycled. Hazardous waste at the site is ~~either returned to PMRF for disposal or~~ disposed of directly to DRMO in Pearl Harbor. (Nesbitt, 1 , 1 Sep, p.1)

PMRF does not operate any storage tanks at the site, and there are no IRP sites. The only explosive ordnance at Port Allen are the signal flares that are required on all ocean-going vessels by U.S. Coast Guard regulations (~~Frearea~~Ferreira, 1 , 23 Oct). PCB management 2
and disposal at Port Allen are handled according to PMRF s PCB disposal plan. Radon is not an issue at the site, and no medical waste is generated.

3.1.6.3 Health and Safety— Port Allen

3.1.6.3.1 Region of Influence

The region of influence for health and safety of workers and the public is the immediate areas around Port Allen.

3.1.6.3.2 Affected Environment

Hazards to health and safety potentially occur as a result of daily operations associated with ship fueling, maintenance of ships and targets (SEPTARs), torpedo transfers, and docking operations. All activities at Port Allen are conducted in accordance with OSHA and OPNAVINST 1 .23D, *Navy Occupational Safety and Health (NAVOSH) Program Manual*. The facility includes a fork-lift truck, hazardous materials storage lockers, and three (two 18, 2 -L , -gal and one , 1-L 2, -gal) fueling trucks. The trucks are filled by a commercial vendor at the facility. All hazardous materials used and hazardous waste generated are handled in accordance with Federal and State regulations. The torpedoes loaded at the site contain no ordnance and are fueled before delivery to Port Allen. The torpedo fuel (otto fuel) has a low volatility level and is nonexplosive.

3.1.6.4 Land Use— Port Allen

3.1.6.4.1 Region of Influence

The region of influence for land use encompasses the land within the boundaries and surrounding Port Allen.

3.1.6.4.2 Affected Environment

3.1.6.4.2.1 Land Use

The PMRF Port Allen area consists of office, storage, and berthing space leased from the State of Hawaii and A B property in the town of Hanapepe. PMRF leases space in two separate warehouses, one area for the towing and retrieval boats along the dock and a second area away from the dock for the SEPTARs. Port Allen is a small harbor and industrial area used by various State and local agencies and private individuals. The land use around the portion of Port Allen leased by the Navy is industrial. According to the State Land Use Classification, Port Allen is within an urban use district. The county has zoned the area as general industrial. The area outside the PMRF area at Port Allen has been designated as open and industrial. A residential area is located ust north of the Port Allen area.

3.1.6.4.2.2 Recreation

The harbor area ad acent to Port Allen provides docking facilities for recreational and commercial boats. No other developed recreational areas are ad acent to Port Allen.

3.1.6.5 Noise— Port Allen

3.1.6.5.1 Region of Influence

The region of influence for noise is the Port Allen site.

3.1.6.5.2 Affected Environment

The ma or noise sources at Port Allen are occasional boat traffic associated with PMRF activities and commercial traffic. Noise at Port Allen is typical of an industrial environment with daytime levels between and dBA ~~caused by ongoing activity~~.

3.1.6.6 Transportation— Port Allen

3.1.6.6.1 Region of Influence

The region of influence for transportation includes the Port Allen site and local road network.

3.1.6.6.2 Affected Environment

Port Allen is reached by Kaumualii Highway from the north and west, Waialo Road from the south, and Halewili Road from the east. The average daily traffic from the . -km (.2-mi) section of road between Halewili Road west unction and Waialo Road is 1 , (State of Hawaii, Department of Transportation, 1 , Jul, p.2) 112

Port Allen handled 1 .3 million kg (1 2, 11 tons) of cargo in 1 (Hawaii Department of Transportation, 1 , p.). 32

3.1.6.7 Utilities— Port Allen

Utilities elements include facilities and systems that provide power, water, wastewater treatment, and disposal of solid waste.

3.1.6.7.1 Region of Influence

The region of influence for utilities is the immediate vicinity of Port Allen.

3.1.6.7.2 Affected Environment

3.1.6.7.2.1 Electricity

Commercial electricity is provided to Port Allen by Kauai Electric Company. Currently, the system is operating within capacity. (Nesbitt, 1 , 1 Sep, p.)

3.1.6.7.2.2 Solid Waste

Refuse generated by activities at Port Allen is collected by the operations and maintenance contractor and delivered to the county-operated sanitary landfill. (U.S. Army Program Executive Office, 1 , May, p.3-2 through 3-21) 12

3.1.6.7.2.3 Wastewater

Port Allen has a State-run cesspool system. No National Pollutant Discharge Elimination System permits are necessary. The systems are inspected periodically by the State, and the tanks are emptied by State-licensed contractors who dispose of the waste according to State regulations.

3.1.6.7.2.4 Water

Port Allen water is supplied by the county. This water is located at Hanapepe, and is delivered from two storage tanks in ~~Beele~~the community of Eleele. The tanks total capacity is 3, 28, L (8 , gal) current demand is within the system s capacity. (Nesbitt, 1 , 1 Sep, p.)

3.1.6.8 Visual and Aesthetic Resources

3.1.6.8.1 Region of Influence

The region of influence for visual and aesthetic resources includes views within Port Allen and the viewsheds that contain Port Allen as an element of their composition.

3.1.6.8.2 Affected Environment

Port Allen is an extensively developed industrial area in Hanapepe Bay. The site is relatively level with numerous industrial storage and warehouse facilities including fuel storage tanks. PMRF leases a portion of a pier in Port Allen, which consists of a long warehouse facility down the center of ~~a~~ the pier and additional space from another warehouse facility above the pier. The entire Port Allen area provides a visual environment typical of any industrial/recreational pier complex. Main public views of the PMRF area are provided by the recreational harbor area. The pier complex does not obstruct any prominent public vistas.

3.1.6.9 Water Resources— Port Allen

3.1.6.9.1 Region of Influence

The region of influence for Port Allen includes the water resources around both the warehouse and storage yard that are associated with the port.

3.1.6.9.2 Affected Environment

3.1.6.9.2.1 Surface Water

Due to the industrial nature of the Port Allen site, there is no surface water associated with the site.

3.1.6.9.2.2 Groundwater

There are no groundwater resources associated with the Port Allen site.

3.2 SUPPORT SITES

3.2.1 NIIHAU

The Island of Niihau is located about 32 km (1 nmi) southwest of Kauai. It is about 13 km (8 mi) wide by 2 km (18 mi) long and comprises approximately 18 . km^2 (2 mi^2). PMRF leases 3. ha (1,1 ac) of land in the northeastern corner of the island. PMRF operates radar units, optics, and electronic warfare sites on Niihau (figure 3.2.1-1).

The island was purchased in 18 by James M. Sinclair and Francis Sinclair. It has been in the possession of their descendants to the present.

3.2.1.1 Air Quality—Niihau

3.2.1.1.1 Region of Influence

The region of influence is the Island of Niihau.

The climate of Niihau is generally similar to that of PMRF/Main Base described in section 3.1.1. . However, Niihau receives even less rainfall, on average, than Kauai. Winds during the dry season have been known to stir up dust, which results in an elevated level of particulates and respirable particulates.

3.2.1.1.2 Affected Environment

Within the region of influence, there are ~~no ma or contributors to emissions of atmospheric pollutants~~two U.S. Navy diesel engine generators, permitted by the State of Hawaii. There are some vehicles used for ranch work, a charcoal kiln, domestic activities in the village, and generators used for local power needs.

Ambient air quality is not monitored on Niihau. However, due to the low population density and lack of industry, air quality at Niihau is expected to be at least as good as that monitored at Lihue (the nearest air quality monitoring station). Based on an extrapolation of data from the nearest air quality monitoring station at Lihue on Kauai, Niihau is expected to be in attainment for all priority/criteria pollutants.

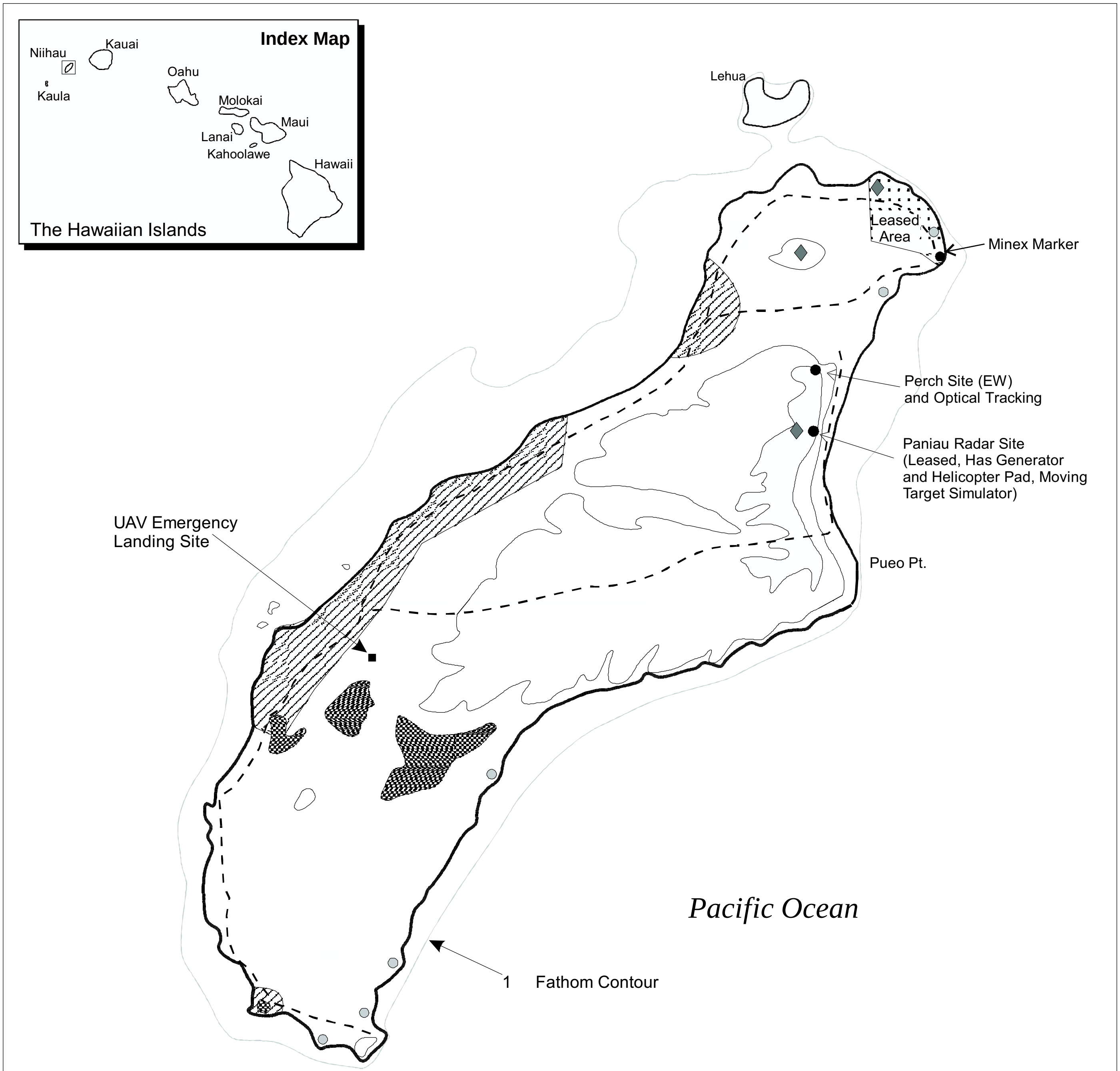
3.2.1.2 Airspace—Niihau

3.2.1.2.1 Region of Influence

The region of influence for airspace includes the Island of Niihau.

3.2.1.2.2 Affected Environment

See section 3.1.1.2 for a description of the affected environment for Niihau airspace.



Source: Modified from Niihau, undated.

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EXPLANATION

Joint Use Approved Areas

Keep-Out one

Lakes (Playa)

Contour Lines

Dirt Roads

Portable Electronic Warfare Sites

Moving Target Simulator Sites

EW Electronic Warfare
UAV Unmanned Aerial Vehicle

NORTH

Scale

2.1 .2 Kilometers

1.3 2. Miles

Niihau

Niihau, Hawaii

Figure 3.2.1-1

niihau 1

3.2.1.3 Biological Resources—Niihau

3.2.1.3.1 Region of Influence

The region of influence for biological resources is the Island of Niihau.

3.2.1.3.2 Affected Environment

3.2.1.3.2.1 Vegetation

The vegetation of the island is dominated by non-native plant species and plant communities. The dominant vegetation type on Niihau is kiawe forest. This community dominates coastal as well as inland areas of the island and forms dense thickets in many locations. On the northern lowland areas, the kiawe forest is more open and forms a mixed coastal dry community, called the ilima (*Sida*) mixed shrub community. This community has a kiawe overstory with an extensive shrub understory of ilima (*Sida fallax*). A dry coastal community, koa haole shrubland, often dominated by pure stands of koa haole ~~(*Leucaena leucocephala*)~~ occurs at scattered locations at higher elevations on the island. This vegetation community is often associated with abandoned pasture areas. In some locations the koa haole canopy is so thick and grazing pressure of feral sheep and pigs so intense that there is little, if any, herbaceous understory. Small mixed stands of eucalyptus (*Eucalyptus sp.*) and common ironwood (*Casuarina equisetifolia*) occur in a few sheltered areas at higher elevations. Ironwood also occurs in coastal areas near the ocean. Scattered individuals of naio (*Myoporum sandwicense*) occur at higher elevations in a mixed kiawe/koa haole shrub association. A coastal dry herbland/grassland community is present along the northeastern coastal region of Niihau.

3.2.1.3.2.2 Wildlife

The wildlife on Niihau is dominated by non-native species. The terrestrial vertebrate animal community is dominated by feral pigs, sheep, cattle, horses, donkeys, turkeys, quail, pheasants, and peacocks. Large numbers of pigs and sheep freely roam the island. The common bird species are introduced species such as the spotted dove ~~(*Streptopelia chinensis*)~~, cardinal (*Cardinalis cardinalis*), and mynah. The migratory Laysan albatross ~~(*Diomedia immutabilis*)~~ nests on Niihau, but its success is limited by ~~depredations~~ depredation of habitat by feral pigs.

3.2.1.3.2.3 Threatened and Endangered Species

The Hawaiian duck ~~(*Anas wysilliana*)~~ also known as Koloamaoli, Common moorhen, or Alac ula ~~(*Gallinula chloropus sandivicensis*)~~ black-necked stilt or Ae o ~~(*Himantopus mexicanus knudseni*)~~ also know as the Hawaiian stilt and the American/Hawaiian coot or Alae Ke oke o ~~(*Fulica americana alai*)~~ are found in and around the lakes (playas) on the southern part of Niihau (see figure ~~2.2.1-8~~2.3. -). The endangered Hawaiian monk seal uses most of the coastline on Niihau to haul out, bask, and occasionally pup. The threatened green sea turtle has been observed to come ashore on selected beaches and occasionally nests at some of these locations.

3.2.1.4 Cultural Resources—Niihau

The Island of Niihau is private property. Niihau has been described as a blank spot on the archaeological map. (Kirch 1 8 , p.1). Archaeological resources information is limited to 1
notes in the Bishop Museum and cultural resource surveys conducted for the U.S. Navy (Pacific Missile Range Facility, 1 8 , May Gonzalez, 1 , Jan Gonzalez, 1 , Nov). Restricted 1 , 2
public access to Niihau has allowed the coastline and beaches to remain in their natural state. 188
Given the traditional uses of beaches and coastlines by native Hawaiians, the fact that the beaches in Niihau are accessed only with permission of the landowners, and that Niihau is undeveloped private property, it would be prudent to assume that any coastal or sandy dune area on the island can be considered to be potentially sensitive in terms of pre-historic, historic, and traditional cultural resources.

3.2.1.4.1 Region of Influence

The region of influence for cultural resources is the Island of Niihau. Specific locations within Niihau that are being considered as potential pro ect activity sites are situated in the north, central, and south areas of the island. The specific pro ect area locations were surveyed for cultural resources.

3.2.1.4.2 Affected Environment

3.2.1.4.2.1 Archaeological Resources

Archaeological work on the island was initially conducted by Mr. John F.G. Stokes of the Bishop Museum in 1 12 (Pacific Missile Range Facility, 1 8 , May, p.3). A reconnaissance survey 1
conducted in May 1 8 by Dr. William Kikuchi of the Kauai Community College has probably been one of the most intensive searches for Hawaiian sites on Niihau. This survey was restricted to the northeastern portion of the island. Sites in this area were recorded and plotted, resulting in the following generalizations:

- No permanent habitation sites were observed.
- Most sites were found above the 3 . -m (1 -ft) elevation line.
- Typical sites found were simple agricultural clearings and enclosures.
- Associated with and among these agricultural sites were C-shaped shelters, temporary habitation (hale pati) features.
- Aerial photographs and surveys show a zone from the coast to the inland areas that is generally bare of any archaeological sites.

The findings support Kikuchi s hypothesis that the northeastern portion of the island was not attractive for permanent habitation. The principal reason seems to have been a lack of water either from springs or from rainfall. Even in historic times, permanent habitation has not been established in this region.

Numerous agricultural-type sites and associated C-shaped shelters suggest that this region, above a 3 . -m (1 -ft) elevation, could have supported some crops for the people s livelihood. The coast or shore areas provided an abundant environment of shellfish, fishes, crustaceans, seaweed, and seabirds. It is those riches that attracted the Hawaiians to these areas. They were aided and fed during their travel to and from this region by the minimal agricultural fields with the C-shaped shelters as temporary refuges (Pacific Missile Range Facility, 1 8 , May, p.23 through 2).

A cultural resources reconnaissance of various facility siting locations for PMRF s enhanced capabilities study was undertaken in January and November 1 . Potential facility siting areas inland of the coastline were inspected for cultural resources. These areas were found to be overgrown by dense stands of *kiawe.* Ground visibility was obscured by vegetation. Clearings where the ground surface was visible were inspected whenever possible.

3.2.1.4.2.2 Historic Resources

Several potentially historic structures and features were noted as a result of the initial cursory reconnaissance survey of potential facilities siting locations. This included an abandoned U.S. Coast Guard Long-range Aid to Navigation (LORAN) station located on the southwestern corner of the island. The station is composed of two deteriorated buildings (a standing quonset hut and the remnants of a wooden structure with metal cross-bar supports). A radial engine from a B-2 that crashed at this location was also observed near the Coast Guard site. The site is heavily vegetated and is habitat to feral pigs. (Gonzalez, 1 , 8-1 Jan, p.1-1). Other 2
historic structures and building foundations related to early ranching activities on the island were also observed during the cursory reconnaissance survey. The locales where the historic sites were observed during this survey are no longer under consideration for any pro ect activity.

3.2.1.4.2.3 Traditional Resources

Traditional cultural resources were observed at one potential facility site in the northern area. This particular site is no longer under consideration for pro ect activities.

No traditional resource area or areas associated with traditional values or beliefs were identified in the other potential facility siting areas. Niihau s elders were consulted with regards to selection of these areas in order to ensure that traditional cultural values and beliefs would not be compromised by any proposed actions at these locations (Robinson, 1 , 2 Oct).

3.2.1.5 Geology and Soils—Niihau

Geology and soils are considered earth resources that may be adversely affected by proposed activities. This resource is described in terms of existing information on the land forms, geology, and associated soil development as it may be sub ect to erosion, flooding, mass wasting, mineral resource consumption, contamination, and alternative land uses resulting from proposed construction and launch activities.

3.2.1.5.1 Region of Influence

The region of influence for geology and soils is the Island of Niihau, specifically those areas directly disturbed by new construction of the Target Launch Facility, Interceptor Launch Area, Aerostat Site, Telemetry/Instrumentation sites and road improvements as well as associated launch hazard areas. Proposed activities for Niihau span a wide variety of physiographic, geologic, and surficial soil settings.

3.2.1.5.2 Affected Environment

3.2.1.5.2.1 Physiography

The Island of Niihau is an elongated, northeast-southwest trending volcanic island, 2 km (1 mi) southwest of Kauai (Pacific Missile Range Facility, 1 8 , May, p.). The island can be characterized by a dissected volcanic upland in the east-central portion of the island, flanked by coastal plains to the north, west, and south. The volcanic uplands attain a maximum elevation of 3 . m (1,281 ft) at Paniau, and form dramatic sea cliffs greater than 3 .8 m (1, ft) in elevation along .8 km (3 mi) of the eastern coastline. Volcanic cones are prominent at each end of the island: Kawaihoa at the southern tip and Lehua, now an island, at the northern end. Seventy-eight percent of Niihau is less than 1 2 m (ft) in elevation. To the west and southwest, slopes ad acent to the volcanic uplands are gentle to relatively flat, creating a dozen playa lakes. No perennial streams exist on the island (Stearns, 1 , p.3). 113

3.2.1.5.2.2 Geology

The volcanic emergence and formation of Niihau is typical of the geologic history of most shield-building volcanoes in the Hawaiian archipelago. Niihau was raised to sea level, or near sea level during a Pliocene volcanic period which deposited large volumes of lava in a subaerial shield-building stage. The dome partially or wholly collapsed, and a significant erosional stage ensued. Coral reefs developed on the summit of the submerged volcano or the beveled base of the subaerial mountain. A second eruptive epoch followed in the Pleistocene, during which tuff craters were formed. The tuff craters were subsequently eroded by wind, waves and runoff, and a submarine terrace was wave-cut around much of the island. Based on field correlations of lithified dunes that extend below sea level and small outcrops of fossiliferous limestone above sea level, Stearns deduced four changes in sea level from the present, oldest to youngest plus 3 . m (1 ft), minus 18.3 m (ft), plus . m (2 ft), and plus 1. m (ft) (Stearns, 1). 113

The volcanic uplands represent the remnants of the Pliocene, main-stage basaltic dome cut by a dike complex trending northeast to southwest (Stearns, 1 p.3). This area has been 113
heavily eroded and deeply incised by stream runoff, forming prominent V-cut valleys that grade westerly and southerly. Stearns named the Tertiary rocks the Paniau Volcanic Series. The central vent area for the basaltic dome is about 3 km (2 mi) out to sea, east of the present island (Stearns, 1 , p.3). 113

The eroded surface of the Tertiary rocks forms a ma or unconformity that was overlain by Pleistocene rocks Stearns referred to as the Kiekle volcanic series olivine basalt lavas and vitric-lithic tuffs deposited from nine vents, and other vents now buried below sediments on the coastal plain. Other Pleistocene deposits include lithified volcanic sand dunes, whose ash material was derived from the tuff cone at Lehua Island at the north end of the island, and consolidated calcareous dunes prominent along the southeast flank of the island.

The coastal plain in the north is underlain by the younger lava deposits. The younger lavas are petrographically distinct from the older basalts, little modified by erosion, and are partially mantled by calcareous material (Kikuchi, 1 8 , May, p.). Studies performed by Macdonald 1 3
(1 2) indicate that lava tubes radiate away from the Pakeho olua vent in the north (Kikuchi, 1 8 , May, p.). These flows created pressure ridges that appear to have shallow to deep 1 3
longitudinal crevices.

Calcareous dune and beach deposits, short stretches of reef and beach rock, and playa and alluvial deposits constitute the Recent rocks (Stearns, 1 , p.3). 113

3.2.1.5.2.3 Soils

The soils of the northern and southern coastal lowlands are described as being entisols, or soils that are weakly developed. Entisols are recent, young soils that have no diagnostic layers and develop on beach sand, recent alluvial deposits, or volcanic ash (University of Hawaii, 1 83, p.). 1

3.2.1.6 Hazardous Materials and Hazardous Waste—Niihau

3.2.1.6.1 Region of Influence

The region of influence for Niihau includes the PMRF activities that use hazardous materials and generate hazardous waste on the Island of Niihau.

3.2.1.6.2 Affected Environment

Hazardous materials are used on the Island of Niihau during the minor maintenance activities associated with PMRF facilities including some solvents, diesel fuel for generators, paint, and oil. These materials are used for the radar unit and electronic warfare site facilities. These materials are brought to Niihau when required for maintenance. General site maintenance is provided by Niihau Ranch. Waste is generated during diesel generator overhaul and maintenance of the radar unit. The used oil is returned to PMRF for recycling. Waste is not left on the Island of Niihau. All hazardous materials used and waste generated is managed in accordance with PMRF procedures described in section 3.1.1. .2.

PMRF does maintain two aboveground diesel fuel storage tanks on Niihau to operate the electrical generators for the radar site and electronic warfare site. These fuel storage tanks consist of a 3, 8 -L (1, -gal) tank for the radar site and a 3 -L (1 -gal) tank for the electronic warfare site. There are no radon issues associated with operation of facilities on Niihau, and there are no IRP sites. These facilities may have capacitors and other components that contain PCBs. When such a part is no longer functional and requires disposal, the component is disposed according to PMRF s Hazardous Waste Management Plan. When a component suspected of containing PCBs needs to be disposed of, the manufacturer is called to determine if PCBs are actually present in the part. Disposal occurs according to the required procedures. Lead-based paint and asbestos-containing material for the above facilities are managed in accordance with developed plans.

3.2.1.7 Health and Safety—Niihau

3.2.1.7.1 Region of Influence

The region of influence for health and safety is Niihau and Lehua islands.

3.2.1.7.2 Affected Environment

The primary health and safety concern to the residents of Niihau is the potential for a fire on the island. Because of the dry climate and kiawe vegetation that dominates the island, there is the potential for very large fires to occur. Currently, the island does not have any fire fighting equipment. Emergency medical evacuation service can be provided by the helicopter owned by the Robinson family. PMRF operates a radar at Paniau that is remotely operated from PMRF/Main Base. The radar unit, which is located on top of a facility, presents no HERP hazards at ground level where any island resident could be affected. PMRF/Main Base also operates the Niihau Perch site electronic warfare system, which has a HERP EMR hazard of 3. m (12 ft) in front of where the system is pointing. A warning light and warning signs are placed in the area when the system is operating. In addition, PMRF flies AEGIS drone targets along the east coast of the island away from inhabited areas. Presently, helicopters are airborne with buckets during nearland/overland operations occurring on or near Niihau to deal with potential fire hazards.

3.2.1.8 Land Use—Niihau

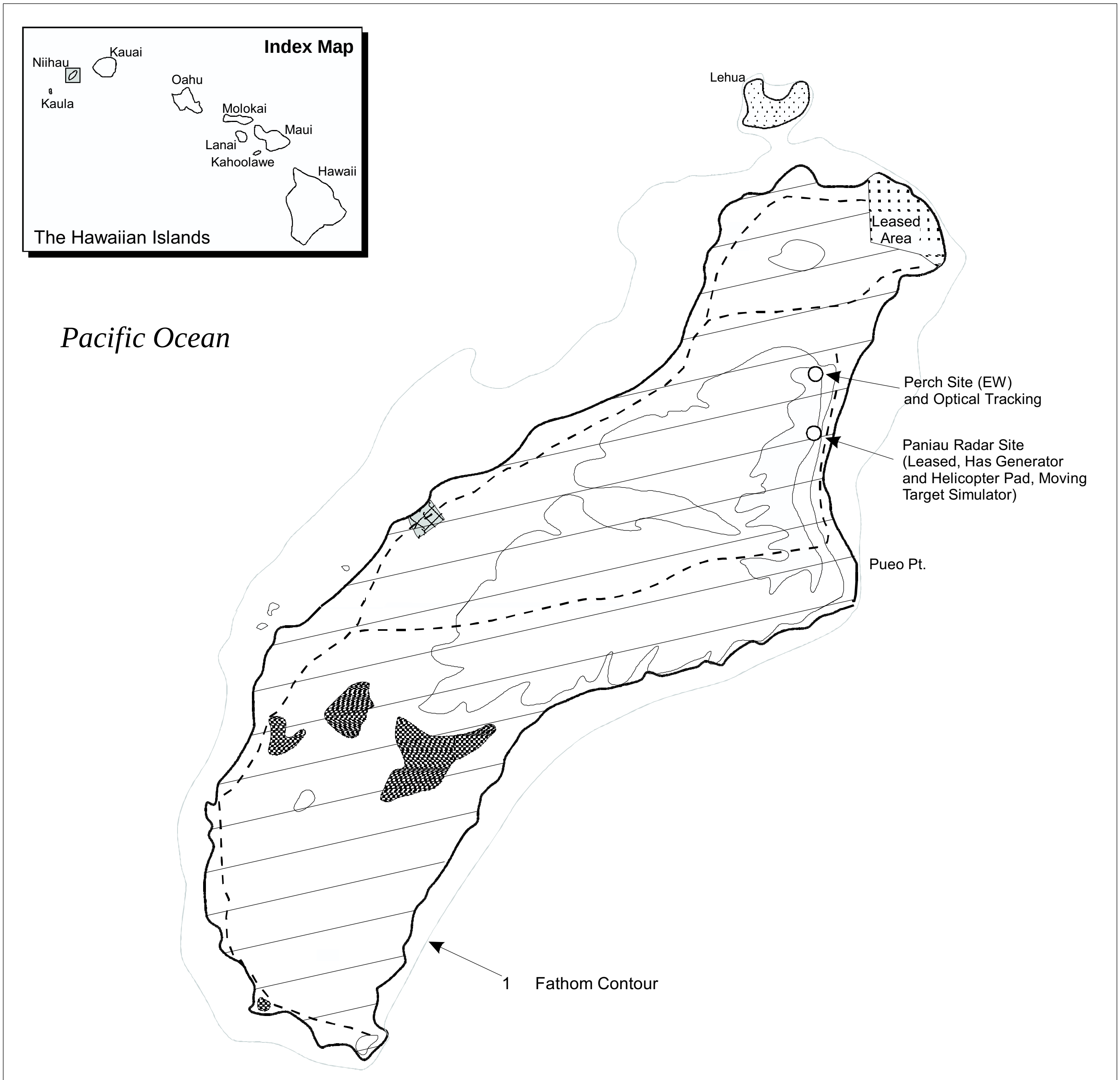
3.2.1.8.1 Region of Influence

The region of influence for land use includes Niihau and Lehua islands.

3.2.1.8.2 Affected Environment

3.2.1.8.2.1 Land Use

The approximately 18, 8 ha (, 2 ac) Island of Niihau is privately owned and operated by the Niihau Ranch. General land use on the island is open, with most of the land devoted to grazing for the estimated 1, cattle (figure 3.2.1.8-1). The island does not have any large developed areas. The Niihau residents are located in a village on the west-central part of the island. An abandoned U.S. Coast Guard station is on the south coast of the island. The station site is overgrown with kiawe and other shrubs. Two dilapidated buildings (a wooden structure and a quonset hut) still exist, but are heavily used by feral pigs. PMRF leases approximately 2 ha (1,1 ac) on the northeastern part of the island as a test vehicle recovery site and operates some range tracking and emitting facilities. PMRF would give 21-day notice prior to any operation. During the remainder of the time, use by Niihau Ranch is not restricted. Niihau residents engage in



Source: Modified from Niihau, undated.

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EXPLANATION

- Dirt Roads
- Grazing/ Agriculture
- Population Center
- Open Land
- Military
- Lakes (Playa)
- Contour Lines
- EW Electronic Warfare

NORTH

Scale
2.1 .2 Kilometers
1.3 2. Miles

Existing Land Use

Niihau, Hawaii

Figure 3.2.1.8-1

important shoreline subsistence fishing pursuits along much of the island s shore, where shells are also gathered for Niihau leis. Shoreline wildlife, such as monk seals and sea turtles, ~~is~~ are protected. Niihau has been designated by the State and County of Kauai as an agricultural use area. (University of Hawaii, 1 83, p.1) 1

Lehua Island is ust north of Niihau and is undeveloped. The island is designated as a conservation use district by the State of Hawaii and is part of the Hawaiian Island State Seabird Sanctuary. Under this designation the sanctuary is managed to conserve, manage, and protect indigenous wildlife. Within the sanctuar~~ies~~y certain activities are prohibited, except by agents of the board and except as authorized by the board or its authorized representative. For details on regulations and activities associated with the State seabird sanctuary, see Kaula Land Use. Regulations are provided in appendix J.

Recreation

Access to Niihau and Lehua is restricted, therefore, there are no public recreational facilities. Island residents on Niihau have access to the entire island for recreational opportunities. Niihau Ranch does offer Niihau safaris (pig and sheep hunting) and helicopter tours. Diving tours are offered in the waters near Niihau and Lehua by several outfitters on Kauai.

3.2.1.9 Noise—Niihau

3.2.1.9.1 Region of Influence

The region of influence for noise is the Island of Niihau.

3.2.1.9.2 Affected Environment

The noise environment of Niihau is quiet. The few ranch vehicles used for transporting materials and personnel do add the sound of internal combustion engines to the existing environment. In addition, the overflight of the island by the Niihau Ranch helicopter for work and tours and the generators used by residents add some additional noise to the baseline sound level. Occasional military aircraft in approved areas contribute to background noise as well.

3.2.1.10 Socioeconomics—Niihau

3.2.1.10.1 Region of Influence

The region of influence for socioeconomics is the Island of Niihau.

3.2.1.10.2 Affected Environment

In 1 , Niihau had approximately 1 inhabitants, compared to 23 in 1 and 22 in 1 8 . The population of Niihau is expected to remain at around 18 in the near term.

The people of Niihau live in the traditional Hawaiian community of Puuwai, where they speak their own dialect of the Hawaiian language and worship in their own Hawaiian language church.

The Island of Niihau has traditionally survived on fishing and ranching. ~~Salt ponds on the southern end of the island are used by Niihau residents for their own salt needs.~~ The island is arid, limiting flora, fauna, and human subsistence. Salt ponds on the southern end of the island are used by Niihau residents for their own salt needs. At times when island resources and activities were particularly limited, the Robinson family has provided some work for Niihau residents at their Kauai holdings in Makaweli (Meyer, 1 8, p.81 through 83).

Niihau has been owned by a single family, the Robinsons, since 18 . The family has been intimately involved in the subsistence economy by providing the island s inhabitants with housing, and horses for work and transportation. Niihau residents have the rights to fish local reefs, to remove shells from local beaches, and to take game (pigs and turkey). The Robinsons Niihau Ranch also provides employment for some island residents. The Ranch currently produces cattle, sheep, charcoal, and honey. The ranch has employed up to approximately Niihau residents on a full-time basis. It currently employs 1 islanders. In 1 , the per capita income was 3,118, while the household income was 1 ,2 . Because of the unique circumstances of Niihau, reliance on these figures does not accurately reflect the well-being of island residents.

Subsistence fishing and employment at Niihau Ranch have been the main ~~bases~~ basis for material survival on Niihau. With traditional fishing and ranching sub ect to adverse pressure, the Robinson family has been attempting to diversify Niihau activities and outputs.

In 1 8 , Niihau acquired a helicopter primarily for medivac purposes. The helicopter has also been utilized for highly organized and carefully regulated tourist trips and hunting safaris to Niihau. Since 1 8 , approximately , tourists have visited Niihau. In addition, military contracting has provided support to an economy that has continually been forced to evolve and respond to changing circumstances.

The PMRF leases 3. ha (1,1 ac) of land on Niihau for observation and testing purposes. In return for access to the island, PMRF is required to agree that all labor support on Niihau is provided by its residents, as well as agreeing to use the barge and helicopter for transportation to and from Kauai. Table 3.2.1-1 illustrates the income earned by the Niihau Ranch by completing tasks for PMRF.

Table 3.2.1–1: Income Earned by Niihau Ranch by Completing Tasks for PMRF

Financial Year	Total Contractual Dollar Earnings (rounded)
1 (part)	2 , 3
1	,38
1	22,
1 (part)	3,13

Source: Pacific Missile Range Facility, Commander, 1 . 83

PMRF activity on Niihau is strictly controlled, with the expressed intent to minimize contact between the islanders and military and non-military personnel ~~to the absolute minimum~~.

The purpose of this agreement between PMRF and the Robinsons is to obtain economic benefit for Niihau, while protecting its unique culture from the pressure of external social forces. Appendix G contains the terms and conditions for the use of Niihau.

3.2.1.11 Transportation—Niihau

3.2.1.11.1 Region of Influence

The region of influence for transportation is the Island of Niihau.

3.2.1.11.2 Affected Environment

The limited existing transportation infrastructure on the Island of Niihau is rudimentary. The existing roads vary from two track to graded dirt with heavy erosion damage. There are a few vehicles on the island, mostly trucks for transport of ranch materials. Transportation to and from Niihau is principally provided by Niihau Ranch via landing barge and helicopter.

3.2.1.12 Utilities—Niihau

3.2.1.12.1 Region of Influence

The region of influence for utilities is the Island of Niihau.

3.2.1.12.2 Affected Environment

There are no central utility systems on the island. Each household is supported by individual systems, such as catchment systems, septic system, solar power, and portable generators.

3.2.1.13 Visual and Aesthetic Resources—Niihau

3.2.1.13.1 Region of Influence

The region of influence for visual and aesthetic resources includes views of Niihau and Lehua islands.

3.2.1.13.2 Affected Environment

The topography of Niihau varies from sea level to 3 m (1,28 ft) on the northeast section of the island. Niihau presents a viewshed from the ocean of a vegetated island with lowlands and beaches in the foreground and mountains in the background along the northern, western, and southern sides of the island. A steep cliff face is present along the eastern side of the island. The original natural setting of the island was changed when grazing and other agricultural practices were implemented. Today the interior of the island is dominated by kiawe vegetation and because of limited rainfall, does not provide a typical tropical vegetation growth found on other Hawaiian Islands. Although there are two facilities present along the cliffs of the eastern part of the island, on the whole, the island presents an uncluttered appearance.

The Paniau radar and Perch sites on Niihau are not visible from the village but do represent a change to the natural visual environment in the immediate vicinity of the sites, especially given the view of the surrounding ocean. The sites do detract from the natural appearance of the surrounding area but are only visible when ad acent to the site. The Perch site s impact on the visual environment is mitigated by the use of earth-tone paint on the exterior of the structure. Most other views of the ocean and the Island of Kauai from Niihau are unobstructed because of the limited development.

Lehua Island topography varies from sea level to 21 m (2 ft). Because no developed facilities are on the island, it presents a natural appearance. Public access to Lehua Island is restricted.

3.2.1.14 Water Resources—Niihau

3.2.1.14.1 Region of Influence

The region of influence for Niihau includes the water resources at several locations on the island.

3.2.1.14.2 Affected Environment

Information on the affected environment is taken from a 1 United States Geological Survey Water Resources Bulletin (Stearns, 1 , p.33 through 38). 113

3.2.1.14.2.1 Surface Water

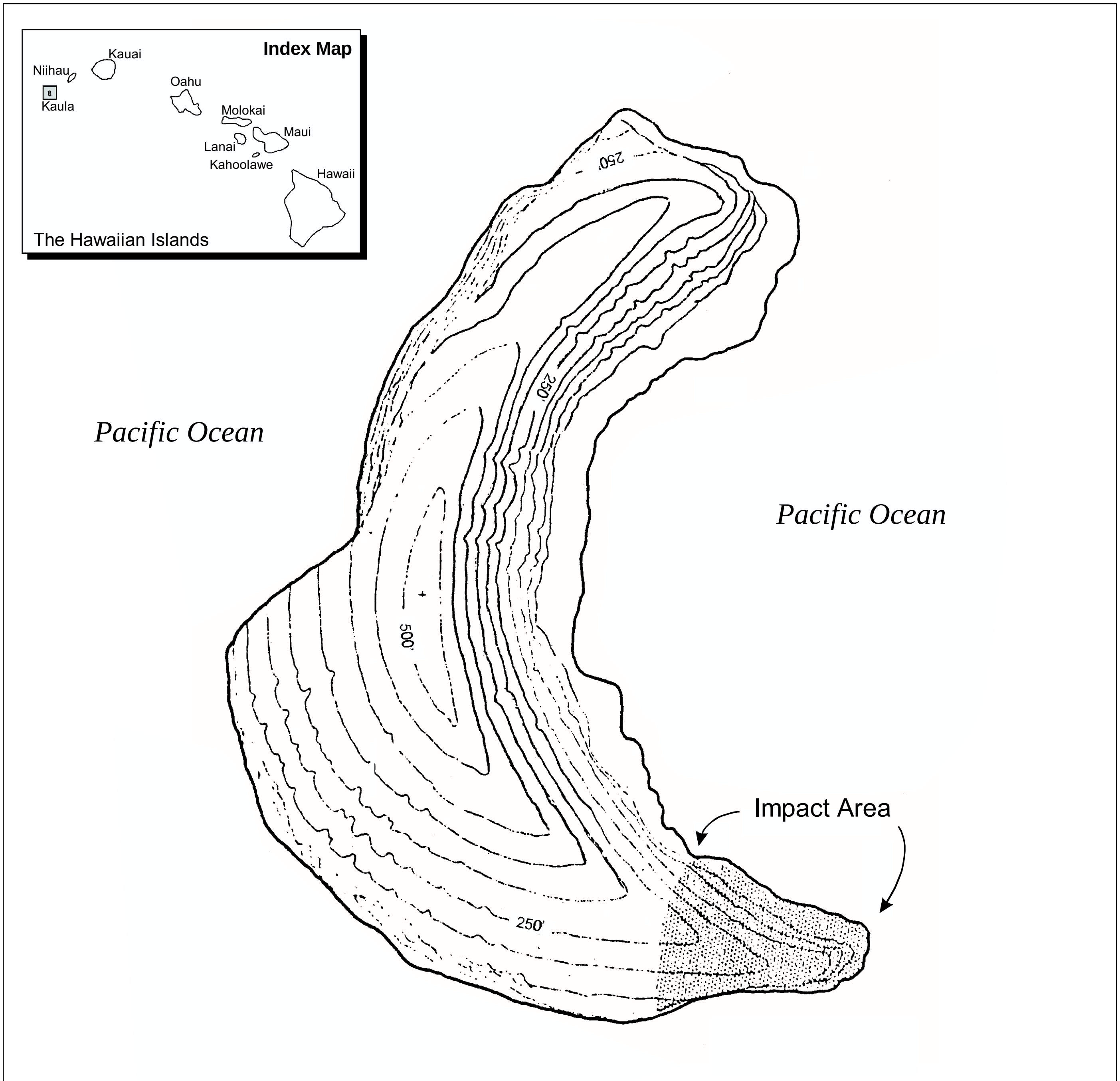
Water resources on the Island of Niihau consist primarily of surface runoff ~~in intermittent drainages~~ following winter rains which collect in playa lakes. Most of the water evaporates, leaving salts. One of the lakes receives some spring inflow. All of the lakes are at elevations that are within a few feet of sea level. Several small springs and seeps are also located on the island at elevations of approximately 1 2 m (ft) above sea level. There are also seep areas at Keanahaki and Kaumuhonu at the 2 m (. ft) elevation level.

3.2.1.14.2.2 Groundwater

Groundwater occurs in beach sand, calcareous dunes, alluvium, eolianite, and the Kiekie and Paniau volcanic series. Water samples were collected from wells and waterholes. Chloride content ranged from 81 to 1 ,3 units. Only three wells yielded water sufficiently low in salt for drinking.

3.2.2 KAULA

Figure 3.2.2-1 shows Kaula in reference to the Hawaiian Island ~~G~~group ~~and the Island of Kaula itself~~. Kaula is approximately 3. ha (1 8 ac) of land owned by the U.S. Government and used by the Navy for aircraft gunnery and inert ordnance target practice. The ordnance impact area is limited to about ha (1 ac) of the island. The island is not inhabited, and there are no structures. Access to the island is restricted. Kaula was transferred to the Coast Guard Lighthouse Service from the Territory of Hawaii in 1 2 .



Source: U.S. Department of the Navy, 1 8 , 2 Feb, Figure 2.

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EXPLANATION

Contour Lines (ft)

Kaula

NORTH

Scale

1 8 21 Meters

3 8 Feet

Kaula, Hawaii

Figure 3.2.2-1

kaula 1

From 1 2 to 1 , the Navy used it as an aerial bombing target under permit from the Coast Guard. In June 1 , Kaula was transferred from the Coast Guard to the Navy. Today, it is used for aircraft gunnery target practice with live ordnance. (U.S. Department of Defense, 1 , 1 Jul, p.D-2) 1

3.2.2.1 Airspace—Kaula

3.2.2.1.1 Region of Influence

The airspace region of influence for Kaula includes the island and surrounding areas.

3.2.2.1.2 Affected Environment

See section 3.1.1.2.2 for a discussion of the Kaula airspace affected environment.

3.2.2.2 Biological Resources—Kaula

3.2.2.2.1 Region of Influence

The region of influence for biological resources associated with Kaula includes the island and the ocean within .8 km (. mi).

3.2.2.2.2 Affected Environment

3.2.2.2.2.1 Vegetation

Low-growing shrubs or herbs that belong to a semi-arid and strand flora dominate the vegetation on Kaula, due to the strong, dry, and continuous winds. A small number of koa haole ~~(*Leucaena leucocephala*)~~ have been noted on the island. The vegetation composition includes endemic Hawaiian species, 1 indigenous species, and 1 introduced (exotic) species. None of the species of plants known to occur on Kaula are listed as endangered or threatened. (U. S. Department of the Navy, 1 8 , 2 Feb, p. , Appendix E) 1 3

3.2.2.2.2.2 Wildlife

Eighteen different species of seabirds have been observed on Kaula. These species appear to be healthy and are reproducing normally. In addition, three species of migratory shorebirds occasionally stop on Kaula seasonally, and six species of exotic (introduced) land birds are also found on the island in small numbers. None of the species of birds listed as endangered or threatened pursuant to the Endangered Species Act of 1 3 occur on Kaula. (U.S. Department of the Navy, 1 8 , 2 Feb, p. through , Appendix F)~~.~~ No other terrestrial wildlife is known to occur on Kaula, and none is expected. 1 3

3.2.2.2.2.3 Threatened and Endangered Species

The humpback whale ~~(*Megaptera novaeangliae*)~~ occurs in the ocean waters off Kaula. The species is listed as endangered under the Endangered Species Act and is protected under the Marine Mammals Protection Act. Four consecutive NMFS humpback whale surveys conducted between 1 and 1 established that humpback whales occur in the nearshore waters of Kaula during the peak of the winter season on an annual basis. (U.S. 1

Department of Commerce, 1 , Sep, p.3) The Navy initiated a formal consultation under 1
the Endangered Species Act with the U.S. Department of Commerce, NMFS, in October 1 8 to determine the effects of Navy use of Kaula on the humpback whale.

~~Three~~ Five species of sea turtles are known to occur in Hawaiian waters. All ~~three~~ five are Federally listed as threatened or endangered species. In March 1 , aerial observations for species of sea turtles were made from a helicopter and on land. No species of sea turtles were observed on Kaula or in the surrounding waters. (U.S. Department of the Navy, 1 8 , 2 Feb, p.) 1 3

3.2.2.3 Cultural Resources—Kaula

3.2.2.3.1 Region of Influence

The region of influence for cultural resources is the Island of Kaula.

3.2.2.3.2 Affected Environment

3.2.2.3.2.1 Archaeological Resources

There is no evidence of extensive human habitation on Kaula, although there are legendary accounts of Hawaiians who visited the area (Keale and Tava, 1 8 , p.1 -1 2). The islet was surveyed in 1 by a State of Hawaii archaeologist. On the top of the spine in the center of the land mass are some loose stones that may have been a man-made platform. There is also a cave with two interior platforms and a low retaining wall at the entrance. There do not appear to be any heiaus, and there are no known sources of fresh water. (U.S. Department of Defense, 1 , 1 Jul, p.D-2) There are no sites on Kaula officially declared State or National 1
historic places as defined in EO 11 3, *Protection and Enhancement of the Cultural Environment*. (U.S. Department of the Navy, 1 8 , 2 Feb, p.) 1 3

3.2.2.3.2.2 Historic Resources

There are no known historic resources or structures on Kaula (U.S. Department of the Navy, 1 8 , 2 Feb, p.). 1 3

3.2.2.3.2.3 Traditional Resources

References to the islet of Kaula have been noted in Hawaiian oral traditions (Keale and Tava, 1 8 , p.1 through 1 2).

3.2.2.4 Geology and Soils—Kaula

Geology and soils are considered earth resources that may be adversely affected by proposed activities.

3.2.2.4.1 Region of Influence

The region of influence for geology and soils is the southern end of the Island of Kaula, specifically, the southernmost ha (1 ac), currently leased for airborne ordnance training.

3.2.2.4.2 Affected Environment

3.2.2.4.2.1 Physiography

Kaula is a small, crescent-shaped volcanic island located southwest ofNiihau. The island is the remnant of a breached volcanic cone that has been heavily eroded. The island is fairly symmetrical, with the highest elevation achieved near the center of the island at slightly greater than 1 2 m (ft). Steep sea cliffs occur around the island perimeter however, the remnants of a narrow wave-cut terrace, cut 2. to 3. m (8 to 1 ft) above current sea level, are evident on the eastern shore. Near the northwest end of the convex (leeward) side of the island, slopes are the steepest, reaching approximately 1 percent and greater. In general, the sea cliffs are relatively smooth however, in some areas, oints and fissures in the rock have promoted large blocks of ash to erode, making elongated sea caves (U.S. Department of the Navy, 1 8 , 2
Feb, p.C-2 through C-3). On the concave windward side, upland slopes generally range from 1 3
to 12 percent. Gullies on the leeward slopes are relatively few and small, whereas those on the windward slopes tend to be more numerous and larger (U.S. Department of the Navy,
1 8 , 2 Feb, p.C-2). 1 3

3.2.2.4.2.2 Geology

The distance and water depth betweenKaula and Niihau suggest that Kaula was an
independent volcanic center (U.S. Department of the Navy, 1 8 , 2 Feb, p.C-1). Earlier 1 3
geologic surveys reported by Palmer (1 2) indicate a geologic history typical of other islands in the Hawaiian chain. Kaula was raised to sea level, or near sea level, during a ma or period of Tertiary volcanism which deposited large volumes of lava. An erosional unconformity ensued, during which coral reefs developed on the summit of the submerged volcano or the beveled base of the subaerial mountain. A second eruptive epoch followed, during which a tuff crater was formed. The crater was probably unsymmetrical, with the leeward side being the highest and the windward side considerably lower, possibly not above sea level.The tuff crater was subsequently eroded by wind, waves, and runoff, and a submarine terrace was cut around most of the island. The sea has since recessed to about . m (1 ft) below the wave cut terrace.

Volcanic rock at Kaula is reported as a light brownish gray tuff (U.S. Department of the Navy,
1 8 , 2 Feb, p.C-3). Embedded in the tuff are olivine nodules, which may be the same age as 1 3
the tuff. Other inclusions encompass fragments of older lava and reef limestone, which suggests that the last phase of volcanic activity dislodged and incorporated these materials
during violent eruptions (U.S. Department of the Navy, 1 8 , 2 Feb, p.C-1). 1 3

3.2.2.4.2.3 Soils

Soil is primarily composed of water lain detritus, which mantles the wave cut terrace on the leeward side of the island. The detritus is fine tocoarse grained tuffaceous material and has not been reworked therefore, the grains are generally angular. The coarsest grains are composed of fresh to decomposed volcanic glass, fine grained basalt, and fragments of bird
bones along with a few olivine fragments (U.S. Department of the Navy, 1 8 , 2 Feb, p.C-3). 1 3
The relicts in the finer grained material suggest that the parent materialwas of basaltic composition. Augite and feldspar, common elements of Hawaiian

basalts, however, have been weathered out (U.S. Department of the Navy, 1 8 , 2 Feb, pC-3). 1 3

3.2.2.5 Health and Safety—Kaula

3.2.2.5.1 Region of Influence

The region of influence for health and safety is Kaula and the immediate surface danger zone around the island.

3.2.2.5.2 Affected Environment

The primary health and safety issue concern associated with Kaula is the aerial inert bombing impact area no other hazardous operations occur on the island. To minimize health and safety risks, a Surface Danger one surrounding Kaula was established for the primary purpose of ensuring an adequate margin of safety to both personnel and equipment during the conduct of gunnery training operations by the military (Fourteenth Naval District, 1 1, 12 Jan, p.1). The 2
Kaula Danger one is defined as the waters within a circular area with a radius of .8 km (3 mi) having its center on Kaula at latitude 21 3 3 , longitude 1 32 3 . (Commander Fleet Air Hawaii, 1 , 1 Dec, p.1). In addition, because of the potential for unexploded ordnance to be 1
present on and ust below the surface of the island and ad acent waters, the island and tidal shoreline are closed to unauthorized personnel at all times. Prior to any bombing activities, an aircraft flies over the island and determines if it is safe to conduct the mission. (U.S. Department of the Navy, 1 , 21 April, p.) 1

To allow some fishing use of the waters surrounding the island (excluding the tidal zone), the Navy does open the surface danger zone on weekends and holidays for fishing by notifying the appropriate State agency. The Commander Fleet Air Hawaii, as the controlling and scheduling agency for the military use of Kaula, is responsible for notifying the DLNR, Division of Fish and Game, State of Hawaii, and Commander Fourteenth Coast Guard District, in writing, of the period of time the Surface Danger one will be opened for fishing (Fourteenth Naval District, 1 1, 12 Jan, p.1). 2

3.2.2.6 Land Use—Kaula

3.2.2.6.1 Region of Influence

The region of influence for land use is Kaula.

3.2.2.6.2 Affected Environment

3.2.2.6.2.1 Land Use

The approximately 3. -ha (1 8-ac) Island of Kaula is owned by the U.S. Government and is used by the Navy for aircraft gunnery target practice. The ordnance impact area is limited to about ha (1 ac) of the island. The Navy has no land use plan for Kaula. The general land use would be weapons testing on the ordnance impact area, with the remainder of the island designated as open and ~~is~~ used as a wildlife protection area. There are no beaches or safe means of landing water craft, no natural sources of fresh water

aside from rainfall, and very shallow topsoil. It appears to have limited potential for human use. (U.S. Department of the Navy, 1 8 , 2 Feb, p.) Because of the safety concerns associated 1 3
with unexploded ordnance, Kaula and the surrounding tidal zone is closed to unauthorized personnel.

According to the State Land Use Classification, Kaula is within a conservation use district within the protective subzone because it is listed as a seabird sanctuary. Although Kaula is part of the City and County of Honolulu, there are no designated land use plans because the effective urisdiction is in the hands of the Federal government. (Department of General Planning, City and County of Honolulu, 1 8 , Feb, p.11) 2

Kaula was designated part of the Hawaii State Seabird Sanctuary in May 1 8 by the Deputy Attorney General. Because the island is a State Seabird Sanctuary, the State Division of Forestry and Wildlife is involved in wildlife protection. (Department of General Planning, City and County of Honolulu, 1 8 , Feb, p.3) Under this designation the sanctuary is managed to 2
conserve, manage, and protect indigenous wildlife.

Other significant statutory and regulatory standards apply to Kaula because of its location in the Hawaii State Bird Sanctuary. Title 13, Department of Land and Natural Resources, Subtitle , Forestry and Wildlife, Part 2 Wildlife, Chapter 12 , Rules Regulating Wildlife Sanctuaries, provides the rules to conserve, manage, and protect indigenous wildlife in sanctuaries.

3.2.2.6.2.2 Recreation

No recreation activities are allowed on Kaula. The Navy does allow fishing in the surface danger zone on most weekends and holidays.

3.2.2.7 Water Resources—Kaula

3.2.2.7.1 Region of Influence

The region of influence for water resources is the Island of Kaula.

3.2.2.7.2 Affected Environment

3.2.2.7.2.1 Surface Water

There is no surface water on Kaula.

3.2.2.7.2.2 Groundwater

No information on groundwater resources, if any, is available for Kaula.

3.2.3 MAUI SPACE SURVEILLANCE SYSTEM

The MSSS is located in the University of Hawaii s Haleakala Observatories complex at the summit of Mount Haleakala on Maui. The 1. -ha (3. -ac) site is leased from the University of Hawaii by the U.S. Army Corps of Engineers on behalf of the U.S. Air Force. The first facilities were constructed in the mid-1 s with additions in 1 2, 1 8 , and 1 8 -8 . The site includes Ground-Based Electro-Optical Deep Space Surveillance and Maui Optical Tracking and Identification facilities.

Figures 3.2.3-1 and 3.2.3-2 show the location of the MSSS and Sandia Maui Haleakala Facility on Mount Haleakala on the Island of Maui. The MSSS is in the University of Hawaii s Haleakala Observatories complex at the summit of Haleakala and includes the AMOS, MOTIF, and GEODSS. The U.S. Army Corps of Engineers leases the parcel on which the MSSS is located from the University of Hawaii, on behalf of the U.S. Air Force. The first U.S. Air Force facilities were constructed in the mid-1 s. Significant additions were made in 1 2, 1 8 , and 1 8 -1 8 . The Sandia facility is leased from the FAA.

Data within this EIS are commensurate with the importance of the potential impacts in order to provide context for evaluating impacts. A review of activities for this location determined that no impacts would occur from PMRF operations. See appendix D for an overview of the resource determination for this site.

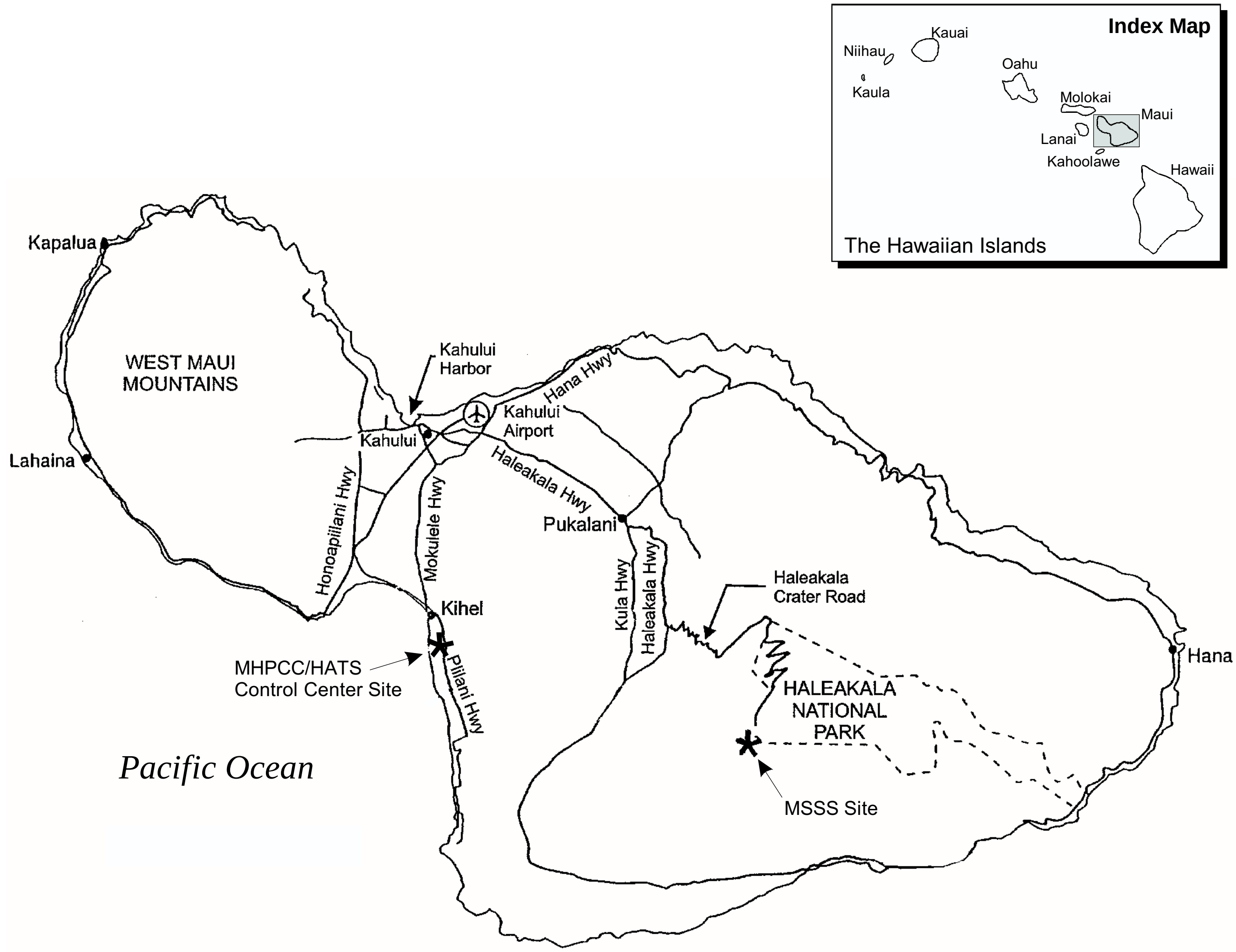
3.2.4 KAENA POINT

The Kaena Point tracking radar used by PMRF and operated by the Air Force is on the Island of Oahu within the Kaena Point AFS. Kaena Point AFS is a 1. -ha (1 2. -ac) site leased from the State of Hawaii. The radar used by PMRF is on a ridge overlooking the Pacific Ocean. Figure 3.2. -1 shows the location of Kaena Point AFS.

Data within this EIS are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts. A review of activities for this location determined that no impacts would occur from PMRF operations. See appendix D for an overview of the resource determination for this site.

3.2.5 WHEELER NETWORK SEGMENT CONTROL/PMRF COMMUNICATION SITES

The Wheeler Network Segment Control is located on Wheeler Army Auxiliary Air Field on the Island of Oahu (figure 3.2. -1). This facility in con unction with transceiver sites on Mount Kaala, Oahu, and Mount Kahili, Kauai, and computer/communication networks on Oahu and Maui provides line-of-sight coverage of PMRF operational areas. In addition, PMRF utilizes data from a radar operated on Mount Kaala, Oahu. PMRF also operates an electronic warfare site at Mauna Kapu, Oahu.



Source: U.S. Department of the Air Force, 1 , February, 2-2.

EXPLANATION

HATS	Hawaiian Area Tracking System
MHPCC	Maui High Performance Computing Center
MSSS	Maui Space Surveillance System

Maui Space Surveillance System Tracking Facilities (Revised)

Maui, Hawaii

NORTH

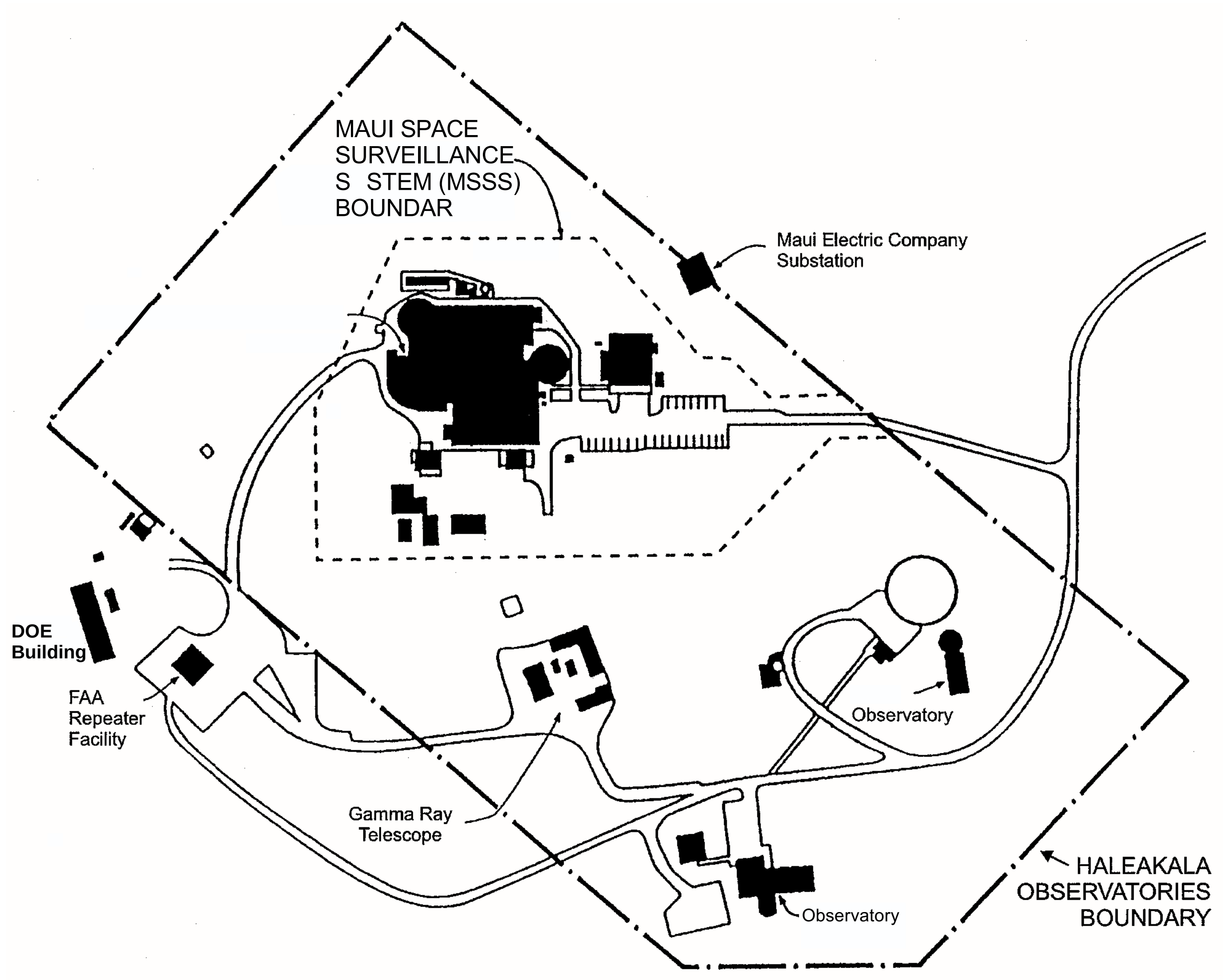
Scale

1 .3 Kilometers

12 Miles

Figure 3.2.3-1

maui 1



Source: Environmental Impact Analysis Process, Programmatic Environmental Assessment
Maui Space Surveillance Site, U.S. Air Force, May 1 1.

EXPLANATION

DOE Department of Energy
FAA Federal Aviation Administration

Maui Space Surveillance System and Department of Energy Locations in Relation to Haleakala Observatory Complex (Revised)

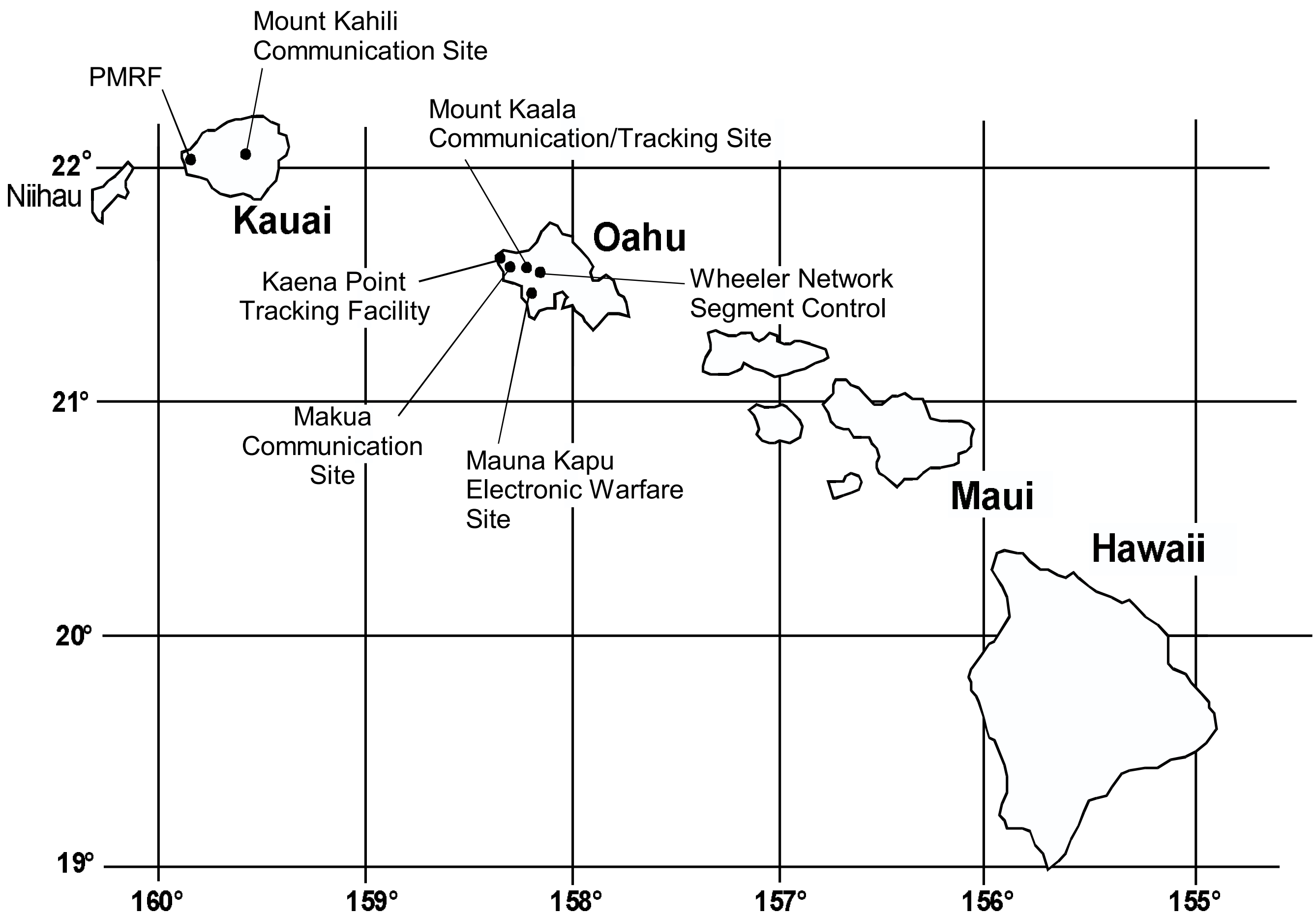
Maui, Hawaii

Figure 3.2.3-2

NORTH

Scale
3 Meters
1 Feet

maui 2



Source: Modified from U.S. Department of Defense, 1 1, Sep, p.2. 148

EXPLANATION

PMRF Pacific Missile Range Facility

Not to Scale

NORTH

Pacific Missile Range Facility-Department of Energy Hawaiian Island Support Facilities (Revised)

Hawaiian Islands

Figure 3.2.4-1

Data within this EIS are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts. A review of activities for these locations determined that no impacts would occur from PMRF operations. See appendix D for an overview of the resource determination for these sites.

3.2.6 DOE COMMUNICATION SITES

The DOE communication sites include the Mount Kahili Repeater Station, Kauai Mauna Kapu Communication Site, Oahu and the Makua Radio/Repeater/Cable Head, Oahu (figure 3.2. -1). The DOE facility on Mount Haleakala is addressed under ~~that site location~~discussion of the MSSS. The Mount Kahili site is leased by DOE through agreement with the County of Kauai. The Mauna Kapu site is leased through the FAA, and the Makua site is on military land used by DOE under agreement with the U.S. Air Force, respectively. (Lautenschleger, 1 , Sep, p.1). 1
Figure 3.2. -1 shows the location of the DOE communication sites.

Data within this EIS are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts. A review of activities for these locations determined that no impacts would occur from operations. See appendix D for an overview of the resource determination for these sites.

3.3 CANDIDATE SITES

3.3.1 TERN ISLAND

Although Tern Island was originally a site alternative in the Draft EIS, the Navy has determined that it is not a reasonable alternative and therefore has been eliminated as a proposed site in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The discussion and analysis on Tern Island has been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island is no longer a reasonable alternative takes precedence over these other discussions concerning Tern Island in this EIS.

Tern Island is a part of French Frigate Shoals and is approximately 1 m (3, ft) long and encompasses an area of approximately 1 ha (3 ac) (see figure 2.3. -). The island was originally about . ha (11 ac). It was expanded to approximately 1 ha (3 ac) by construction of a seawall and filling in with dredged material from nearby reefs to provide a runway and facilities to operate the island as a training area and as a stopover for movement of aircraft to Midway Atoll before, during, and following World War II.

The island was operated as a military installation until a Coast Guard station was established on Tern Island, which was in operation there until 1 8. At that time, the island was transferred to the USFWS.

3.3.1.1 Air Quality— Tern Island

3.3.1.1.1 Region of Influence

The region of influence for air quality is Tern Island itself.

3.3.1.1.2 Affected Environment

The greatest characteristic of regional air quality is the almost complete lack of emissions sources. Periodic motor exhaust, intermittent open burning, aircraft-stirred dust and related conditions may be temporarily offensive (Pacific Missile Range Facility, 1 , Mar, p.3-3). 82
However, these emissions are temporary and ~~sporadic~~ infrequent in nature and do not degrade the local environment for any extended period of time.

There are no air quality monitoring stations on or near Tern Island. Therefore, it is unclassifiable for National and State AAQS. However, due to its separation from air pollution emissions other than the minimal sources noted above, it is reasonable to assume that the Tern Island area is in attainment for both National and State AAQS.

3.3.1.2 Airspace— Tern Island

3.3.1.2.1 Region of Influence

The region of influence for airspace includes Tern Island and surrounding areas.

3.3.1.2.2 Affected Environment

See section 3. .1.3 for a discussion of the Tern Island affected environment.

3.3.1.3 Biological Resources— Tern Island

3.3.1.3.1 Region of Influence

The region of influence for Tern Island and the French Frigate Shoals biological resources would be the launch hazard area and that portion of the launch corridor traversing the atoll.

3.3.1.3.2 Affected Environment

3.3.1.3.2.1 Vegetation

The vegetation on Tern Island is dominated by a mix of indigenous and naturalized alien species. Common indigenous species include scaevola (*Scaevola sericea*), beach morning glory (*Ipomea pes-caprae*), Alena (*Boerhavia repens*), aheahea (*Chenopodium oahuense*), and bunchgrass (*Lepturus repens*). Common naturalized species include *Sporobulus pyramidatus*, tree heliotrope (*Tournefortia argentea*), salt-marsh (*Spergularia marina*), cheesewood (*Malva parviflora*), and pigweed (*Portulaca oleracea*). Ironwood (*Casuarina equisetifolia*) ~~(iron wood)~~ is present in scattered locations on the island. Algal communities located in the near-shore environment of Tern Island serve as a source of forage food for the Hawaiian green sea turtle (U.S. Department of the Interior, 1 8, 22 May, p.). None 1 1 of the plants known to occur on Tern Island are listed as threatened or endangered by the USFWS or the State of Hawaii.

3.3.1.3.2.2 Wildlife

Eighteen species of seabirds nest on Tern Island, and the total population at times exceeds 2 , . One or more species are breeding in large numbers on the Island throughout the year. Species include black-footed and Laysan albatross, Bonin and Bulwer s petrel, wedge-tailed and Christmas shearwater, masked and red-footed booby, and great frigatebird, among others. The wedge-tailed shearwaters and Bonin petrels nest in sandy burrows. Figure 3.3.1.3-1 gives the generalized breeding cycles of seabirds that use Tern Island. Although Tern Island has dense seabird colonies numbering in the thousands and comprising 18 different species, and is vital habitat for wintering migratory shorebirds (U.S. Department of the Interior, 1 8, 22 May, p.), ~~N~~none of the bird species that use Tern Island are listed as threatened or 1 2
endangered by the USFWS or the State of Hawaii.

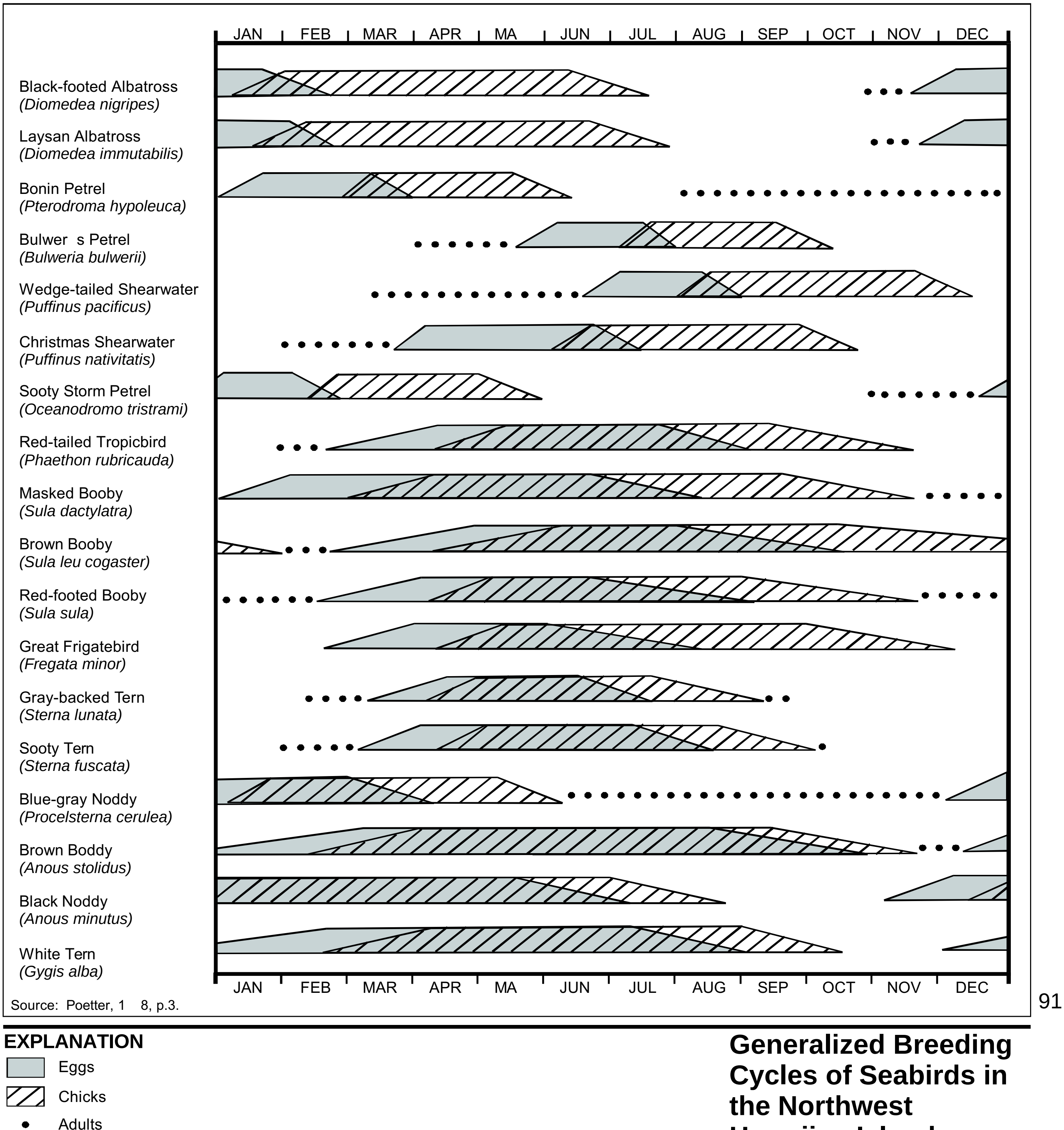
The lagoon and marine waters of French Frigate Shoals and those around Tern Island support a variety of fish and other marine species. Many of the fish species are commercially important and are harvested outside refuge boundaries. Benthic slope resources ad acent to French Frigate Shoals and other islands and atolls of the HINWR include several species of bottom fish of considerable commercial importance. Pelagic fishes of the offshore zone in the HINWR are a source of commercial interest for both U.S. and foreign boats.

Lobsters occur in nearshore waters but also range into substantially greater depths, where most commercial fishing occurs. Within atoll lagoons, they use coral reefs, where they find shelter, food, and protection from predation. (Pacific Missile Range Facility, 1 , Mar, 3-12, 3-18 through 3-22, 3-2) 82

3.3.1.3.2.3 Special Habitats

In May 1 88, the NMFS designated critical habitat for the Hawaiian monk seal ~~out~~ from shore (including beaches) to 3 . m (2 fathoms) in areas of the Northwestern Hawaiian Islands, including the French Frigate Shoals. The seals require undisturbed sandy beaches to haul out to rest, give birth, and nurse their young. The NMFS believes that these areas require special management consideration or protection now and in the reasonably foreseeable future. (National Marine Fisheries Service, 1 , 1 Jan, URL http://www.nmfs.gov/tmcintyr/pinniped/hawaiian.html)

Coral-reef habitat fronting Tern Island provides the basic foundation for habitat that supports diverse communities of other highly specialized organisms. Corals contribute the bulk of the calcareous material that forms and maintains the basic structural framework of the reef. Coral colonies add significantly to the submarine topographic relief in which a large number of fish and invertebrate species find shelter and food. The institutional significance of coral reefs has been established through their formal designation as special aquatic sites (CFR 23 . /FRV n2). Such sites possess special ecological characteristics of productivity, habitat, wildlife protection, and other important and easily disrupted ecological values (U.S. Department of the Interior, 1 8, 22 May, p.). 1 1



Generalized Breeding Cycles of Seabirds in the Northwest Hawaiian Islands

Figure 3.3.1.3-1

3.3.1.3.2.4 Threatened and Endangered Species

The endangered Hawaiian monk seal ~~(*Monachus schauinslandi*)~~ and the threatened green sea turtle ~~(*Chelonia mydas*)~~ are common residents of the French Frigate Shoals and are present at Tern Island. The monk seal pups on Tern Island, but not in as large numbers as elsewhere within the French Frigate Shoals. Currently, the beach count of Hawaiian monk seals at French Frigate Shoals represents nearly half of the census for the entire archipelago. The trend in population size has been generally downward since the mid to late 1 8 s. The primary pupping season for the Hawaiian monk seal runs from February through October. It is possible to have a pup born the rest of the year, but it is infrequent (Poetter, 1 8, p.3). 8

The French Frigate Shoals colony of Hawaiian monk seals is the species largest breeding colony and has been declining since the late 1 8 s because of very poor uvenile survival attributed primarily to a decline in prey availability. In 1 , pup survival was particularly low because of aggression by adult males toward pups and shark predation at the atoll s principal pupping beaches on East, Trig, and Whaleskate Islands. Most French Frigate Shoals pups are born at these locations, while Tern Island is used principally by adults and sub-adults other than nursing females and pups. Thus, there is some segregation by age and sex in monk seal distribution among the various islands at French Frigate Shoals (Marine Mammal Commission, 1 8, 2 May, p. 2). Other factors affecting or potentially affecting monks seal population 1 recovery are: entanglement in marine debris entrapment in failing seawalls and mortality due to ciguatera poisoning (Marine Mammal Commission, 1 8, 2 May, p.). 1

In addition to changes in the numbers of monk seals at any one location, there have been changes in the distribution of seals. For example, the number of monk seals on Tern Island beaches increased substantially after the Coast Guard closed its Long-range Aid to Navigation (LORAN) station ~~in 1~~. It took several years for monk seal numbers at Tern island to reach their present level after ~~the Coast Guard closed its LORAN station in 1 and after~~ human activity was strictly controlled by the USFWS (Marine Mammal Commission, 1 8, 2 May, p.8). 1

As has been the case elsewhere, human disturbance was a significant factor affecting the seal haul-out patterns on Tern island. Radio-tracking studies indicate that the principal seal foraging area lies along the northern edge of the atoll and that Tern Island is the closest haul-out site to this feeding area. As such, Tern Island may be a particularly important haul-out site for the atoll s seal colony (Marine Mammal Commission, 1 8, 2 May, p.). 1

The threatened green sea turtle is the only marine turtle species, of the three species that are known to occur in the Hawaiian Islands, that is widely distributed throughout the archipelago. Over percent of green sea turtle nesting in the Hawaiian Islands takes place on the islands of French Frigate Shoals. It commonly occurs in the waters around Tern Island and comes ashore to bask and to nest on the ~~i~~island. In 1 , more than 8 potential turtle nests were recorded on Tern Island alone (U.S. Department of the Interior, 1 8, 22 May). 1 1

3.3.1.4 Cultural Resources— Tern Island

A general discussion of cultural resources applicable to Tern Island can be found in section 3.1.1. .

3.3.1.4.1 Region of Influence

The region of influence for historic cultural resources is composed of Tern Island and the lagoon area immediately ad acent to it.

3.3.1.4.2 Affected Environment

The French Frigate Shoals were first visited by two French ships under the command of La Perouse in November 1 8 . Many additional sailing ships visited the shoals and other islands of the Northern Hawaiian Chain over the next century, and several of these ended their voyage as shipwrecks on shallow reefs.

French Frigate Shoals is of particular historical significance because of the military activities that have occurred there. Remnants of this activity include the dredged seaplane runways and channels, Tern Island and its associated buildings and facilities, and debris on East Island resulting from the Coast Guard Long-range Aid to Navigation (LORAN) station that occupied the island from 1 until 1 2. (Pacific Missile Range Facility, 1 , Mar, p.3-2 through 3-2) 83

Tern Island was constructed in support of the Allied Pacific Theater war effort. It is an artificially enlarged geological structure which was constructed by the U.S. Navy in 1 3 by dredging coral from the existing lagoon and using it as fill to create an artificial island approximately .8 m (3,1 ft) long by 1 . m (3 ft) wide. The fill material was partially rimmed with 1, 2 m (, ft) of steel sheet piling driven to a depth of . m (1 ft) (The Smithsonian Institution, 1 1, 2 Dec, p.). ~~It was commissioned as a new Naval Air Facility in March 1 3.~~ 118 The purpose of enlarging the original island was to provide fueling and landing facilities for ferrying aircraft between Pearl Harbor and Midway Island. It would also serve as an emergency aircraft landing facility and as an outpost in the defense of Pearl Harbor (The Smithsonian Institution, 1 1, 2 Dec, p. through 1). It was commissioned as a new Naval Air Facility in March 1 3. 118

3.3.1.4.2.1 Archaeological Resources

Tern Island is not known to be a traditional cultural property and is devoid of any pre-World War II cultural materials.

3.3.1.4.2.2 Historical Resources

Potential historic cultural materials that have been observed on Tern Island consist of a submerged World War II military tank situated in the boat channel area of the lagoon directly north of the island, the World War II steel sea wall barrier on the north side of the island (which protects it from ~~eroding into the sea~~severe wave erosion), and the dilapidated remnant structures from the formerly occupied U.S. Coast Guard LORAN facility (Soto, 1 1

1 , Jan). Tern Island has not as yet been evaluated in terms of its role in the history of World War II or its engineering uniqueness (Raymond, 1 , 12 Sep). 1 1

3.3.1.4.2.3 Traditional Resources

Tern Island is not known to be a traditional cultural property (Raymond, 1 , 12 Sep).

3.3.1.5 Geology and Soils— Tern Island

Geology and soils are considered earth resources that may be adversely affected by proposed activities. This resource is described in terms of existing information on the land forms, geology, and associated soil development as it may be sub ect to erosion, flooding, mass wasting, contamination, and alternative land uses resulting from proposed construction and launch activities.

3.3.1.5.1 Region of Influence

The region of influence for geology and soils is the land within theentire Island of Tern, specifically, those areas directly disturbed by new construction of a Target Launch Facility, Telemetry/Instrumentation, docking facilities, and associated launch hazard area.

3.3.1.5.2 Affected Environment

3.3.1.5.2.1 Physiography

Tern Island has been modified by dredge and fill activity into an elongated east north-east trending artificial island suitable to accommodate a 1 -m (3, -ft) runway and several support facilities. Sandspits seasonally accumulate at various points along the island, most notably at the east northeast end of the runway. The island is relatively flat~~and~~ achieving a surface elevation of ~~is ust~~ a few feet above sea level.

3.3.1.5.2.2 Geology

The geologic history and geology of Tern Island are similar to that described for Johnston Atoll (section 3.3.2. .2).

3.3.1.5.2.3 Soils

The soils for Tern Island are similar to those described for Johnston Atoll (section 3.3.2. .2).

3.3.1.6 Hazardous Materials and Hazardous Waste— Tern Island

3.3.1.6.1 Region of Influence

The region of influence includes the geographic land boundaries of Tern Island.

3.3.1.6.2 Affected Environment

From 1 2 to 1 , the U.S. Coast Guard operated a LORAN station on Tern Island. Prior to this, the U.S. Navy operated an airfield and fueling station on the island from 1 2 to 1 . Large quantities of uncharacterized debris were landfilled on the island, and some was pushed directly into the ocean. U.S. Coast Guard field surveys conducted in 1 revealed that the marine debris consisted of batteries, transformers, a fuel tank, and other ob ects potentially hazardous to the environment. U.S. Coast Guard geophysical surveys of the land on the north side of the island, which is contained behind a deteriorating seawall, revealed massive quantities of metallic debris buried along most of the northern shore. The U.S. Coast Guard plans to remove the marine debris in September 1 8. The Service is currently completing the Service Contaminant Assessment Process Manual for Tern Island that will identify all potential sources of contamination on the island. (Poetter, 1 88, p.2) 88

The USFWS utilizes small amounts of hazardous material associated with daily operations on Tern Island. These materials include fuel for diesel generators and ship use, solvents for maintenance activities, and motor oil. Hazardous wastes generated from site activities are disposed offsite in accordance with Federal regulations. The USFWS maintains two 1 2,2 -L (2 , -gal) ~~diesel~~ aboveground diesel storage tanks associated with the hybrid photovoltaic power system. The system saves over 3 , per year in diesel fuel and transportation costs. (Sandia National Laboratories, 1 , Jun, p.1)

No pesticides are used on Tern Island in the Hawaiian Islands National Wildlife Refuge, and radon is not an issue. There are no known IRP sites on the island. Given the construction type and age of the facilities on Tern Island, they may contain lead-based paint and asbestos-containing material. No data is available on the potential for PCB-containing equipment on the island.

3.3.1.7 Health and Safety — Tern Island

3.3.1.7.1 Region of Influence

The region of influence for health and safety is Tern Island.

3.3.1.7.2 Affected Environment

The primary health and safety issues at Tern Island are associated with the current operations conducted by the USFWS. ~~To maintain management of the HINWR two 1 2,2 -L (2 , -gal) diesel fuel tanks and associated generators are used for power and~~ USFWS personnel occasionally use small generators, and occasional aircraft operations occur to provide logistic support. The use of these items do not present any offsite public health and safety issues. However, the USFWS provides a vital emergency service for the surrounding area. The USFWS has assisted in rescue operations of grounded vessels in the French Frigate Shoals, can respond to oil or chemical spills, and provide radio and supply support to fisherman within the region. The runway can be used for emergency evacuation of vessel crew members in the region, if necessary. Since USFWS occupation in 1 , there have been three emergency evacuation flights involving vessel crewmen and involving a USFWS volunteer. (U.S. Department of the Interior, 1 8 , May, p. . through .) 1

3.3.1.8 Land Use— Tern Island

3.3.1.8.1 Region of Influence

The region of influence for land use includes Tern Island and the~~Hawaiian National Wildlife Refuge~~HINWR.

3.3.1.8.2 Affected Environment

3.3.1.8.2.1 Land Use

Tern Island is operated by the USFWS and is used to monitor wildlife activities and manage the HINWR. The general land uses of the facility include a 1 -m (3, -ft) runway in the center of the island and four ma or buildings in the southwest corner used by the USFWS for research, living quarters, and administrative purposes. The remainder of the island is open and managed for resource protection. Tern Island is located within the State s protectivesubzone of the conservation use district. (U.S. Department of the Interior, 1 8 , May, p. .22 and .3 through
.) Although Tern Island is part of the City and County of Honolulu, there are no designated 1
land use plans because the effective urisdiction is in the hands of Federal government.
(Department of General Planning, City and County of Honolulu, 1 8 , Feb, p.11) 2

Tern Island is part of the HINWR, which was established in 1 by Presidential EO for use as a preserve and breeding ground for native birds. The mission of the USFWS within the HINWR is to provide the Federal leadership to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the people (e.g., environmental education, wildlife interpretation, wildlife photography, and commercial and recreational fishing). (U.S. Department
of the Interior, 1 8 , May, p. .3) 1

Other significant statutory and regulatory standards apply to Tern Island because of its location in the HINWR. Operation and management of national wildlife refuges are influenced by a wide array of laws, treaties, and EOs pertaining to the conservation and protection of natural and cultural resources. Among the most important orders and laws affecting the operation and management of refuges are EO 12 of 1 , *Management and General Public Use of the National Wildlife Refuge System* the Refuge Recreation Action of 1 2 the National Wildlife Refuge System Administration Improvement Act of 1 and the Endangered Species Act of 1 3.

The National Wildlife Refuge System Administration Improvement Act addresses the issue of use compatibility within ~~the~~ a wildlife refuge. This act authorizes the Secretary of the Interior to permit uses of a refuge whenever he determines that such uses are compatible with the ma or purposes for which such areas were established. As part of the original National Wildlife Refuge System Administration Act of 1 , the U.S. Fish and Wildlife Service prepared a *Refuge Manual* and a procedure for determining compatibility of uses on National Wildlife Refuges. The Improvement Act of 1 requires that the USFWS has 2 months from enactment to issue final regulations establishing the process for determining whether a use of a refuge is a compatible use. In general, a compatible use is a use that will not materially interfere with or detract from the purposes for which the refuge was established. (U.S. Fish
and Wildlife Service, undated, p.1) 1

Under the existing *Refuge Manual*, compatibility determinations are based on a site-specific physical, geological, and biological analysis of anticipated impacts of an action in terms of the resources that represent the purposes for which the refuge was established. A request for a determination of compatibility is filed with the refuge manager with regional and Washington office review where warranted. Impacts to be considered include direct, indirect, and cumulative impacts. Also, compatibility takes into consideration whether impacts are short term or long term in nature. Preparing an EIS or Environmental Assessment as set forth in NEPA assists in satisfying this analysis.

Refuge management plans provide a further refinement of the data needed to determine compatibility by considering the temporal and spatial requirements of the relevant uses. Uses may include both land and water, provided that the affected area is within the urisdiction of the Refuge. Under the 1 National Wildlife Refuge System Administration Improvement Act, provisions relating to determinations of compatibility of a use shall not apply tooverflights above a refuge.

3.3.1.8.2.2 Recreation

Public use of the HINWR is highly restricted because of the presence of endangered species and the high potential for introduction of exotic organisms to the fragile environment. Sports fishing is not allowed within the boundaries of the refuge. Recreational fishing by USFWS personnel, special usepermittees, and other visitors is allowed at the French Frigate Shoals (e.g., Tern Island), but is limited to catch and release using appropriate techniques and equipment. (U.S. Department of the Interior, 1 3, p.) 1 8

3.3.1.9 Noise— Tern Island

3.3.1.9.1 Region of Influence

The region of influence for noise includes Tern Island.

3.3.1.9.2 Affected Environment

The ma or noise sources at Tern Island are associated with the diesel generators used for power and the occasional aircraft using the airstrip. The noise environment is typical of a rural environment, with noise levels between 3 and dBA. The refuge station runs primarily on solar power. No large generators are used. One small, less than kW, generator is used to power the boat hoist and to charge the battery banks during extended bad weather. This generator is operated for fewer than 1 hours per year (U.S. Department of the Interior, 1 8, 22 May, p.). 1 1

3.3.1.10 Transportation— Tern Island

3.3.1.10.1 Region of Influence

The transportation region of influence would be the entire island.

3.3.1.10.2 Affected Environment

Tern Island currently has no regular road system and no normal traffic. There is a 1 -m (3, -ft) runway on the island. Transportation services to and from the island are provided by light aircraft and, on rare occasion, ~~very occasionally~~ by barge.

3.3.1.11 Utilities— Tern Island

3.3.1.11.1 Region of Influence

The region of influence is the utility systems that support Tern Island.

3.3.1.11.2 Affected Environment

There is no regular utility infrastructure on Tern Island. All existing facilities are self-contained (for example, solar powered generators).

3.3.1.12 Visual and Aesthetic Resources— Tern Island

3.3.1.12.1 Region of Influence

The region of influence for visual and aesthetic resources includes views of Tern Island.

3.3.1.12.2 Affected Environment

Tern Island, which was approximately . ha (11 ac), was enlarged to 1 ha (3 ac) by constructing a seawall and filling with material dredged from nearby reefs. The overall topography of the island is flat, and the vegetation is low shrub. Theoriginal visual environment at Tern Island was changed by the addition of four facilities, a -m (3 -ft) NOAA weather tower, and a runway down the center. Also, most of the island is enclosed in a wood and steel piling sea wall. The area that surrounds the island provides scenic vistas of marine and terrestrial areas. However, no prominent public vistas are obstructed since few individuals have the opportunity to visit the area because public access is restricted.

3.3.1.13 Water Resources— Tern Island

3.3.1.13.1 Region of Influence

The region of influence for water resources includes theland mass of Tern Island.

3.3.1.13.2 Affected Environment

3.3.1.13.2.1 Surface Water

There is no surface water on Tern Island. The only permanently standing water in the HINWR is the hypersaline lagoon atLaysan. (Pacific Missile Range Facility, 1 , Mar, p.3-11) 82

3.3.1.13.2.2 Groundwater

Historic records indicate that potable brackish water could be found 1. to 3m (to 1 ft) below the ground surface on several of the sandy islands within the HINWR. On the rocky islands, rain water percolates through the porous basalt until it reaches layers of dike material. Groundwater flows along the upper surface of dense materials, and where it reaches the ground surface, fresh water seeps are found. (Pacific Missile Range Facility, 1   , Mar, p.3-11) 82

3.3.2 JOHNSTON ATOLL

Although Johnston Atoll was originally a site alternative in the Draft EIS, the Navy has determined that it is not a reasonable alternative and therefore has been eliminated as a proposed site in this EIS. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Johnston Atoll has been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Johnston Atoll is no longer a reasonable alternative takes precedence over these other discussions concerning Johnston Atoll in this EIS.

Johnston Atoll is located in the Central Pacific Ocean 1,32 km (1 nmi) west-southwest of Honolulu, Hawaii and 8 3 km (nmi) south of French Frigate Shoals. Because of the great distances to other islands, Johnston Atoll is one of the most remote atolls in the world. It is the ~~nearest~~ only land ~~to~~ in over ~~2,123, 3~~ 2,123,   km^2 (~~3 ,~~   3 ,13 nmi^2) of ocean. The atoll consists of approximately 12,   ha (32,   ac) of coral reef shallows containing four small islands totaling 28 ha (1 ac).

The Johnston Archipelago consists of Johnston Island, Sand Island, and two man-made islands commonly known as Akau (North) Island and Hikima (East) Island (see figure 2.3. -~~8~~).

Since the days of high altitude and exoatmospheric nuclear testing, Johnston Island has, on many occasions, served as the rocket launch point for scientific and engineering investigation and for active military defense systems. The primary activity on Johnston Island today is the JACADS, which results in an island population of approximately 1,3   people. Johnston Atoll is under the administration of the Air Force and is managed by the DSWA. Johnston Atoll is also a National Wildlife Refuge and is administered for that purpose by the USFWS. The atoll was established as a wildlife refuge in 1 2 .

3.3.2.1 Air Quality— Johnston Atoll

3.3.2.1.1 Region of Influence

The region of influence for air quality on Johnston Atoll is the area exposed to levels of air pollutants in excess of the National Ambient Air Quality Standards (NAAQS) or health-based guideline levels. This area is generally less than 1. to 3.2 km (1 to 2mi) downwind of the pollution source.

3.3.2.1.2 Affected Environment

Johnston Atoll has a hot and humid climate with little seasonal change in temperature or precipitation. It is located in the easterly tradewind zone of the Central Pacific where winds are active year-round. Temperatures are uniformly high throughout the year, ranging from 22 to 3 C (3 to 8 F). Humidity is constantly high at approximately percent. Average rainfall is about 1 cm (28 in.).

Johnston Atoll has no indigenous population. The ma or population center is on Johnston Island. ~~The o~~ Other outlying areas are minimally developed at best. The ma or sources of air pollution on Johnston Atoll are the JACADS incinerator and the airfield. Neither of these sources contributes significantly to degradation of the island s air quality.

3.3.2.2 Airspace— Johnston Atoll

3.3.2.2.1 Region of Influence

The region of influence for airspace at Johnston Atoll includes the atoll islands and surrounding area.

3.3.2.2.2 Affected Environment

See section 3. .1.3 for a discussion of the Johnston Atoll affected environment.

3.3.2.3 Biological Resources— Johnston Atoll

3.3.2.3.1 Region of Influence

The region of influence for biological resources at Johnston Atoll includes all four islands, the atoll waters between and ad acent to the islands, and the atoll area within the launch corridor where it traverses the atoll.

3.3.2.3.2 Affected Environment

Johnston Atoll is a designated National Wildlife Refuge. It is an isolated atoll about 8 2 km (nmi) south of French Frigate Shoals, its nearest neighbor. The North Equatorial Current flows westward around the atoll, and the wake caused by the diversion of the current creates turbulence and upwelling of nutrients from deeper waters. These nutrients support a richer marine biota than is available in the surrounding ocean and consequently provides a feeding ground that supports thousands of seabirds that roost and breed on the islands of the atoll. (U.S. Department of the Interior, 1 , p.1) It is estimated that more than 21 , breeding pairs of 1
seabirds, representing 1 different species, use the islands of Johnston Atoll In addition, Johnston Atoll s reefs support more than 3 species of reef fish. (U.S. Department of the Interior, 1 8, 22 May, p.) 1 1

The Refuge was established by EO No. of President Calvin Coolidge as a refuge and breeding ground for native birds. At present, the Refuge is managed as nesting and roosting habitat for 1 species of seabirds, wintering habitat for species of shorebirds, and as habitat for a diverse assemblage of marine animals, including the threatened green sea turtle. (U.S. Department of the Interior, 1 3, p.1-3). 1

3.3.2.3.2.1 Vegetation

The vegetation on Johnston Island is dominated by introduced species of forbs, grasses, trees, and shrubs including coconut palm, ironwood, seagrape, hibiscus, *Scaevola sericea* and *Pluchea cardensis*. The vegetation on the three outer islands of Johnston Atoll are generally low growing forbs and grasses, with some prostrate perennials and occasional taller shrubs such as *Scaevola sericea* and *Pluchaea*. The shrubs provide additional nesting habitat for seabirds.

3.3.2.3.2.2 Wildlife

As noted above, Johnston Atoll provides roosting and breeding grounds for 1 species of tropical Pacific seabirds and wintering grounds for five species of migratory shorebirds. Most of the nesting activity of the seabirds takes place on the three outer islands North Island, East Island, and Sand Island. The ongoing activities of humans, and the lack of nesting habitat on Johnston Island minimizes the use of the island by most of the seabird populations. Sand Island has been modified by adding ~~a portion using~~ dredged material however, the part of the island containing the natural substrate supports burrow nesting species such as the wedge-tailed shearwater.

The value of Johnston Atoll has expanded from the initial emphasis on seabirds to also recognize the potential uniqueness and importance of its marine resources. The coral reef ecosystem at Johnston Atoll is unique in that Hawaiian and western and southern Pacific organisms are represented, including corals, fish, mollusks, crabs, and urchins. Although there have been several studies of elements of the Johnston Atoll marine resources, the nature, distribution, and extent of the resources throughout the shallow-water area of the atoll and the marine ecosystem are not well known. Given the atoll s age and isolation, many undescribed species could be present. *Acropora* and *Montipora* species dominate the coral community, with *Acropora cytherea* being especially dominant in coverage. This species, commonly called table coral, provides an extensive three-dimensional habitat for many fishes. About 3 species of fishes are documented from the atoll. These resources are of particular concern because of the status of Johnston Atoll as a National Wildlife Refuge. (U.S. Department of the Army, 1 8 , 12 Nov, p.1) 1

Cuvier s beaked whales (*Ziphius cavirostris*) a rare species, but not listed as threatened or endangered, are sighted in the lagoon or around the atoll. In 1 3, however, there were no reported sightings. There is one record of a beaked whale calving in the Johnston Atoll area (Di Rosa, 1 , Jul and Sep). 21

Female gray reef sharks congregate in the lagoon on the south side of the eastern portion of Sand Island from about mid-February to early May (Di Rosa, 1 , Jul and Sep). The number of sharks fluctuates from year to year however, up to 1 have been observed. This congregating phenomenon is not unique to Johnston Atoll similar gray reef shark behavior is known in the other remote South Pacific islands (U.S. Department of the Army, 1 8 , 12 Nov, p. 2 through 3, 2 through , 1 through 2). 21 1

3.3.2.3.2.3 Threatened and Endangered Species

Endangered Hawaiian monk seals ~~(*Monachus schauinslandi*)~~ have historically, at least since 1 8, used Johnston Atoll intermittently in very low numbers. In 1 8 , nine monk seals were relocated to Johnston Atoll from Laysan Island in the Northwest Hawaiian Islands, but had disappeared within 2 years (Di Rosa, 1 , Jul and Sep). Since that time, occasional sightings 21
of single individuals have been reported. In the fall of 1 , three individuals were observed on the south side of Johnston Island (Di Rosa, 1 , Jul and Sep). It is unpredictable when they 21
will appear in the atoll waters, and they are rarely observed on the north side of Johnston Island (Di Rosa, 1 , Jul and Sep). 21

The Refuge supports a population of the threatened green sea turtle ~~(*Chelonia mydas*)~~. They feed extensively on the algae beds located on the south side of Johnston Atoll. The turtles do not nest at Johnston Atoll, although mating has been observed off the south shore of Johnston Island.

Turtle monitoring has been conducted since 1 88. Initially, counts were made from the tower at the southeastern end of the JACADS peninsula. Current counts are made from a location at the sewage treatment plant. Based on the counts, it is estimated that the population numbers are stable or slightly increasing, with the current estimate at between 2 and 3 individuals (Di Rosa, 1 , Jul and Sep). 21

There have been documented sightings of the endangered humpback whale ~~(*Megaptera novaeangliae*)~~ outside of the reef in recent years. Numerous sightings occur each winter. In the 1 1/1 2 winter, a mother and calf were seen, and in 1 /1 two adults and two calves were observed. The calves were believed to be too small to have traveled with the mother from calving grounds in the Hawaiian Islands. Johnston Atoll may be important to at least a few humpbacks every year, and speculation is that it may have been (Di Rosa, 1 , Jul and Sep), and it might be, a calving area for this species. 21

3.3.2.4 Cultural Resources— Johnston Atoll

3.3.2.4.1 Region of Influence

The region of influence for historic cultural resources at Johnston Atoll includes Johnston and Sand Islands as well as North and East Island.

3.3.2.4.2 Affected Environment

Johnston Atoll was discovered in 18 by British Sea Captain Charles James Johnston. During the late 18 s, the atoll was claimed by both the Kingdom of Great Britain and the United States. This claim was settled when U.S. annexed Hawaii as a territory. The atoll was designated a National Wildlife Refuge in 1 2 . In 1 3 , Johnston Atoll was transferred to and administered by the U.S. Navy. It was transferred again in 1 8 to the Air Force. During the Cold War the atoll was used to conduct high-altitude atmospheric nuclear testing. From 1 3 to 1 Joint Task Force 8 retained operational control of the atoll. In 1 , the atoll was again transferred to the Air Force. Host-management responsibility for Johnston Atoll was given by the Deputy Secretary of Defense in July

1 3 to the DSWA (formerly the Defense Nuclear Agency), which continues to perform that mission (Defense Special Weapons Agency, 1 , Oct, p.2). 1

Johnston Atoll is composed of four small islands with a total area of 28 ha (1 ac). ~~Two of the islands, North and East, were artificially constructed by dredging that occurred in the early 1 s.~~ In the late 1 3 s, Johnston and Sand Islands were modified and expanded by dredging and filling. This work continued into the 1 s. Two of the islands, North and East, were artificially constructed by dredging that occurred in the early 1 s. There are no known traditional cultural properties on Johnston and Sand islands.

3.3.2.4.2.1 Archaeological Resources

There are no known archaeological resources on Johnston and Sand Islands. Considering that the atoll consists of a built environment on artificial islands, the existence of archaeological resources would not be expected.

3.3.2.4.2.2 Historic Resources

Johnston Atoll has played a significant role ~~in~~ during the 1 s and 1 s ~~modern world history~~ as a DOE nuclear atmospheric testing facility ~~during the 1 s and 1 s~~. In recent years, Johnston Island has served as a storage facility for a portion of DOD s stockpile of obsolete chemical weapons. The Army also constructed the JACADS facility in 1 . This computerized high technology facility utilizes robotics to disassemble munitions and prepare them for high temperature incineration. The installation s significant role during the Cold War as a nuclear weapons testing site and its current status as a unique high technology engineering facility for chemical demilitarization of products produced during that period could eventually qualify it as eligible for listing in the National Register as a Historic District.

3.3.2.4.2.3 Traditional Resources

There are no known traditional cultural properties of traditional resources on Johnston and Sand islands.

Since current activities at Johnston Island are under urisdiction of the DSWA, DOD policies for the management of archaeological and historic resources asestablished by DOD Directive 1 .1 (*Archaeological and Historic Resources Management*, dated 21 June 1 8) would be applicable.

3.3.2.5 Geology and Soils— Johnston Atoll

Geology and soils are considered earthresources which may be adversely affected by proposed activities. This resource is described in terms of existing information on the land forms, geology, and associated soil development as it may be sub ect to erosion, flooding, mass wasting, contamination, and alternative land uses resulting from proposed construction and launch activities.

3.3.2.5.1 Region of Influence

The region of influence for geology and soils is the land within the entire island of Johnston Atoll, specifically, those areas directly disturbed by new construction of a Target Launch Facility, telemetry/instrumentation site, and associated launch hazard area.

3.3.2.5.2 Affected Environment

3.3.2.5.2.1 Physiography

Johnston Island is the largest island of the Johnston Atoll, a series of reef carbonate islands exposed on the west side of Johnston Bank. Between 1 38 and 1 , the original island was expanded from 1 to 2 3 ha (to 2 ac) by dredging carbonate sand and coral rubble from nearby sources on Johnston Bank to create a harbor, shipping channel, and airfield (Department of the Army, 1 , Jun, p. -). Johnston Island is flat lying, approximately 3 km (2 1
mi) long and .8 km (. mi) wide, and dominated by a ma or concrete runway.

Three other small coral islands, North Island, Sand Island, and East Island, are located in close proximity, north to northeast respectively, from Johnston Island. North and East islands are being evaluated as potential target launch sites, and Sand Island is being evaluated as a potential instrumentation site. The origin and surface expression of the three islands are similar to Johnston Island.

3.3.2.5.2.2 Geology

Johnston Atoll was formed by the growth of a coral reef around an isolated volcanic cone known as the Johnston Seamount (U.S. Defense Nuclear Agency Field Command, 1 ,
1 July, p.8). Wave erosion planed off the top of the cone, and coral reefs were formed and 1 3
accreted to compensate for sea floor subsidence, which gradually lowered the seamount below the surface of the sea to its current depth of greater than 1, 2 m (, ft) (Keating and Helsley, 1 8). Subsidence was followed by a period of tilting of the entire atoll such that the southeast side sank and the northwest side was raised. Only the northwest rim of the atoll is
emergent (U.S. Defense Nuclear Agency Field Command, 1 , 1 July, p.8). 1 3

The near surface stratigraphy at Johnston Island is characterized by a sequence of carbonate sediments. Most prominent is a well cemented sandstone layer of old beach sand (beach rock) which underlies most of the island at elevations of - . to 1.2 m (-2 to ft) and with thickness ranging from 1.2 to .3 m (to 1 ft). The sandstone has a high crushing strength of 1, psi and is difficult to penetrate during pile driving operations (U.S. Defense Nuclear Agency Field
Command, 1 , 1 July, p.8). The beach rock overlies a 3 to -m thick (1 - to 3 -ft thick) 1 3
section of white to pink dense beach sand. This unit in turn overlies a thick deposit of white lagoon sediment composed of angular coral fragments in a silt matrix. The sediment does not consolidate with depth and has not been penetrated in borings as great as m (18 ft).

3.3.2.5.2.3 Soils

Originally, the surface of the island consisted of Modern beach deposits of carbonate sand and coral fragments. Today, there has been so much reworking of the soil due to construction and dredge and fill operations, that it is difficult to differentiate native from artificial materials. The soils generally consist of a loose to medium dense mixture of coral fragments in a silty sand matrix. The soil above the beach rock is very permeable (U.S. Defense Nuclear Agency Field Command, 1   , 1 Jul, p.8). 1 3

3.3.2.6 Hazardous Materials and Hazardous Waste— Johnston Atoll

3.3.2.6.1 Region of Influence

The region of influence includes the geographic land boundaries of Johnston, East, Sand, and North islands.

3.3.2.6.2 Affected Environment

Johnston Atoll has a chemical weapon storage program which is under the control of the U.S. Army Pacific. (U.S. Department of Defense, 1   , 1 Apr, p.2) The Army operates the storage 1 facility, which houses . percent of the nation s stockpile of obsolete chemical weapons. (U.S. Department of the Interior, 1 3, p.1 through) 1

Additionally, the atoll is the site for the congressionally mandated National Chemical Demilitarization Program. (U.S. Department of Defense, 1   , 1 Apr, p.1) In 1   , the Army 1 built the JACADS. The JACADS facility is an incinerator whose purpose is to destroy outdated or hazardous munitions. The facility is scheduled to complete the demilitarization of munitions stored on Johnston Island by December 1   . However, the treatment of secondary wastes generated by JACADS will likely push the final pro ect completion date into the year 2   . (U.S. Environmental Protection Agency, 1   , 1 Jul, p. -8) 1

Other hazardous materials used on the island are associated with daily operations of Johnston Island. These materials typically include solvents, paints, fuels, motor oil, batteries, hydraulic fluids, pesticides, and degreasers. Hazardous materials used onsite are handled in accordance with Federal regulations. Hazardous waste generated by these materials, including medical waste, is shipped from Johnston Island to approved hazardous waste disposal facilities.

There are both RCRA Part A and Part B Permits issued to the Defense Nuclear Agency (DNA) and the Army on Johnston Island. The permits involve the storage and destruction of Army chemical agents. They also pertain to the storage and release of hazardous waste and its constituents from several of the 1 identified Solid Waste Management Units. (U.S. Department of the Interior, 1 3, p.12) 1

Previous studies have shown that the number of Solid Waste Management Units on Johnston Atoll could increase in the future. It is expected that all identified sitesare sub ect to investigation and possible corrective action measures as required by the EPA. (U.S. Department of the Interior, 1 3, p.11) 1

On North Island, an abandoned firing range has contaminated the area with lead. Little information is available on the island, and it is not included in *The Johnston Atoll Installation Restoration Program Management Action Plan* (U.S. Department of the Interior, 1 3, p.3). 1
There are no Solid Waste Management Units or IRP sites on East Island.

Sand Island is the site of the old Coast Guard LORAN Station. During an underwater survey of the island in 1 3, large amounts of discarded debris and potentially hazardous waste were discovered. An analysis of marine sediment took place to determine if contaminants were present. Results of this preliminary sampling were not conclusive they indicated contaminants were present, but the level of contamination could not be determined. The Coast Guard agreed to fund a more thorough sediment sampling and testing regime in 1 to try to determine the extent and amount of contamination. The preliminary results found detectable levels of lead, mercury, arsenic, cadmium, zinc, and PCBs. (U.S. Department of the Interior, 1 3, p.3 through 31) Contamination on Sand Island was remediated by the Coast Guard, and there are 1
no outstanding IRP sites.

Three rocket explosions (one on the launch pad and two in the atmosphere) occurred during the atmospheric nuclear test launches of the 1 s and 1 s at Johnston Atoll. The contamination that resulted was the scattering of radioactive raw plutonium about the islands and launch site. (U.S. Department of the Interior, 1 3, p.23). A study concluded that the risks 1
to humans entering the site are minimal and, depending on the nature of the work, monitoring ~~in and out~~ upon arrival and departure is all that is required. Generally, but depending on the nature of the work, no protective clothing is required. (U.S. Department of the Interior, 1 3, p.23) 1

On Sand, East, and North islands, all fuel-related storage tanks and PCBs have been removed. The only remaining fuel tanks are associated with water storage.

Given the age and type of construction of the facilities on Sand, East, and North islands where proposed TBMD and TMD activities could take place, the existing facilities may contain both lead-based paint and asbestos-containing material.

3.3.2.7 Health and Safety— Johnston Atoll

3.3.2.7.1 Region of Influence

The region of influence for health and safety is Johnston Atoll.

3.3.2.7.2 Affected Environment

The primary health and safety concern associated with Johnston Atoll is the storage and incineration of chemical weapons in the JACADS. In addition, other types of ordnance are stored on Johnston Island, and some of the soil is contaminated. The overall safety program on Johnston Atoll is a function of the Field Commander and the tenant commanders. The D~~W~~SWA makes routine inspections trips to the atoll to ensure safety standards are being met and corrections are implemented where necessary. Contaminated and hazardous operations areas are controlled and periodic sampling is accomplished to ensure personnel safety. (U.S. Defense Nuclear Agency, 1 , Jul, p.1) The base maintains a Disaster Preparedness Plan 1 3
and a Radiation Safety Program. (U.S. Defense 1 3

Nuclear Agency, 1 , Jul, p.) In the years JACADS has processed chemical weapons, there has been no documented harm caused to any humans or animals as a result of its operations. 1 3

Fire protection for Johnston Island is provided by a pressurized salt water fire hydrant system backed up by unlimited salt water direct from the lagoon. Five fire fighting trucks are assigned, including two crash/structure, one airfield/ramp, one structure, and one crash rescue. A forcible entry vehicle and hazardous materials vehicle are also available to respond. (U.S. Defense Nuclear Agency, 1 , Jul, p.1) 1 3

The installation maintains airfield safety regulations for the arrival and departure of aircraft as well as on base personnel safety. Although the base uses Air Force guidelines for airfield safety, several exemptions exist because of ~~the~~ limited available space on the island. (U. S. Defense Nuclear Agency, 1 , Jul, p.13) 1 3

3.3.2.8 Land Use— Johnston Atoll

3.3.2.8.1 Region of Influence

The region of influence for land use includes Johnston Atoll and the Johnston Atoll National Wildlife Refuge (JANWR).

3.3.2.8.2 Affected Environment

3.3.2.8.2.1 Land Use

Johnston Atoll consists of four small islands Johnston, Sand, North, and East enclosed in an egg-shaped reef approximately 3 km (21 mi) in circumference. Johnston Atoll is a strategic military installation under the administration of the Air Force and is managed by the DSWA. Johnston Atoll is also a National Wildlife Refuge and is administered for that purpose by the USFWS. General development at Johnston Atoll is outlined in the Base Master Plan. The general land use of Johnston Island is developed, similar to any small military installation with maintenance/warehousing, base support services, administration, and living quarters. The main feature on the island is the runway which occupies the center portion of the island. The main base population including housing and recreational facilities are mainly north of the runway. The JACADS is south of the main runway along with chemical storage areas. Concrete launch pads and a launch control bunker are still present at Huema Point, which is currently an Environmental Protection Agency (EPA)-permitted RCRA storage facility for hazardous waste (U.S. Defense Nuclear Agency, 1 , Jul, p.13). 1 3 Sand Island is currently being used for a marine laboratory consisting of two buildings, with the remainder of the island as open use (wildlife resource protection). North Island has one large building and several smaller buildings, with the remainder of the island being open use (wildlife resource protection). East Island has two small buildings, with the remainder of the island being open use (wildlife resource protection).

In 1 , Johnston Island Reservation s title was changed to Johnston Atoll National Wildlife Refuge, which was established as a refuge and breeding ground for native birds (U.S. Department of the Interior, 1 3). 1 8 Although primary management of the area belongs to DOD, the USFWS is given primary responsibility for the protection and

management of the atoll s natural resources through a Memorandum of Understanding (U.S. Defense Nuclear Agency, 1 , Jun, p.32). No construction or digging except for an 1
emergency can take place without the authorization of USFWS personnel (U.S. Department of the Interior, 1 3, p.). 1 8

3.3.2.8.2.2 Recreation

Access to Johnston Atoll is restricted therefore, there are no public recreational facilities. There are a multitude of recreational opportunities for persons stationed on Johnston Atoll including water sports, basketball, bowling, fishing, softball, and golf.

3.3.2.9 Noise— Johnston Atoll

3.3.2.9.1 Region of Influence

The region of influence for noise includes Johnston Atoll.

3.3.2.9.2 Affected Environment

Noise on Johnston Atoll is generated by occasional aircraft, diesel generators, the incineration facility, and other equipment used to operate Johnston Island. The noise level on the island can be expected to be similar to any military installation with noise levels of between to dBA, depending on time of day and location. On Sand, North, and East islands, little human-related noise is generated. Most of the noise on these islands is generated by the large bird populations, which at times can generate moderate noise levels.

3.3.2.10 Transportation— Johnston Atoll

3.3.2.10.1 Region of Influence

The region of influence for transportation includes Johnston Atoll.

3.3.2.10.2 Affected Environment

Johnston Atoll currently has no regular road system and no normal traffic. There is a runway on the island. Transportation services to and from the island are provided by aircraft and very occasionally by barge.

3.3.2.11 Utilities— Johnston Atoll

3.3.2.11.1 Region of Influence

The region of influence for utilities includes Johnston Atoll.

3.3.2.11.2 Affected Environment

3.3.2.11.2.1 Electricity

Electrical power is provided to Johnston Island by five 2, -kW and one 1, -kW generators in the Johnston Atoll power plant. This facility also provides power to Sand

Island through an underwater feeder. Power feeders to North and East islands are inactive and would require replacement if activated.

3.3.2.11.2.2 Solid Waste

Solid waste is disposed of by the management and operations contractor.

3.3.2.11.2.3 Wastewater

Wastewater on Johnston Island is provided by a sewage treatment plant located on the southwest peninsula, which has a capacity of 3,1 L (12 , gal). The sanitary sewer systems on Sand, East, and North islands use septic tanks with seweroutfall into the lagoon. The facilities on Sand Island are inactive, and those on the other islands are not operational.

3.3.2.11.2.4 Water

Potable water at Johnston Island is provided by utilizing saltwater through a treatment process. The fresh water plant produces 1, 1 ,1 L (, gal) of fresh water per day. Fresh water is stored in underground storage tanks. No fresh water is provided to Sand, East, or North islands. All water must be brought to these locations.

3.3.2.12 Visual and Aesthetic Resources— Johnston Atoll

3.3.2.12.1 Region of Influence

The region of influence for visual and aesthetic resources encompasses Johnston Atoll and the surrounding viewshed.

3.3.2.12.2 Affected Environment

The original visual environment of Johnston Atoll was changed with the development of military facilities. Today, Johnston Atoll consists of four islands, with most of Johnston and Sand islands being made from dredging pro ects and all of North and East Islands being man made. The Johnston Island visual environment is similar to most DOD installations, with a runway, industrial and administrative buildings, housing, and recreational areas (i.e., golf course, baseball diamonds). Sand, North, and South islands are relatively open with some facilities. The overall topography of all four islands is flat. The area that surrounds the island provides scenic vistas of marine and ~~terrestrial areas~~proximal low-lying islands. However, no prominent public vistas are obstructed because relatively few individuals have the opportunity to visit the area, since public access is restricted.

3.3.2.13 Water Resources— Johnston Atoll

3.3.2.13.1 Region of Influence

The region of influence for water resources encompasses Johnston Island, Sand Island, North Island, and East Island.

3.3.2.13.2 Affected Environment

3.3.2.13.2.1 Surface Water

There are no natural fresh water bodies on Johnston Atoll. Their absence is due to the high permeability of the coral, the low rainfall, and the small size of the land area. (U.S. Defense Nuclear Agency, 1 , 1 Jun, p.2) 1

3.3.2.13.2.2 Groundwater

A very thin lens of brackish water underlies the old, original part of Johnson Atoll. This lens of tea/coffee colored groundwater lies at a depth of to 8 ft below the surface. The groundwater experiences minor fluctuations in the height of the water table due to tidal variations. The water bears a slight odor of hydrogen sulfide, a result of solubleorganic material from the old guano deposits which were not completely mined. With time, the thin lens of water underlying the old island will extend into the fine colloidal material of the fill areas. (U.S. Defense Nuclear Agency, 1 , 1 Jul, p.8) 1 3

The soil above the beach rock layer is very permeable. For unpaved areas, with due allowance made for further consolidation of the fill material over time, it is estimated that the run-off coefficient will eventually stabilize at a value where approximately percent of the water will run off, and percent will percolate into the ground. (U.S. Defense Nuclear Agency, 1 , 1 Jul, p.8) 1 3

There is no data on groundwater conditions on Sand, East, or North islands.

3.4 OCEAN AREA (OUTSIDE U.S. TERRITORY)

3.4.1 AIRSPACE USE— OCEAN AREA (OUTSIDE U.S. TERRITORY)

3.4.1.1 Description of Resource

Airspace, or that space which lies above a nation and comes under its urisdiction, is generally viewed as being unlimited. However, it is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. The time dimension is a very important factor in airspace management and air traffic control.

3.4.1.2 Region of Influence

The region of influence is defined as that area that would be affected by the ongoing No-action Alternative and would be potentially affected by the Proposed Action that would utilize portions of the international airspace over the open Pacific Ocean.

3.4.1.3 Affected Environment

The affected airspace use environment in the Ocean Area region of influence is described below in terms of its principal attributes, namely: controlled and uncontrolled airspace, special use airspace, en route airways and et routes, airports and airfields, and air traffic control. There are no military training routes in the ROI.

3.4.1.3.1 Controlled and Uncontrolled Airspace

The airspace beyond the ~~22.2-km (12-nmi)~~territorial limit is in international airspace. Because it is in international airspace, the procedures of the International Civil Aviation Organization (ICAO), outlined in ICAO Document , *Rules of the Air and Air Traffic Services*, are followed. ICAO Document is the equivalent air traffic control manual to FAA Handbook 11 . , *Air Traffic Control*. The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the region of influence is managed by the Honolulu ARTCC and the Oakland ARTCC (figure 3. .1-1).

3.4.1.3.2 Special Use Airspace

The special use airspace in the Ocean Area region of influence, consisting of Warning Areas W-18 , W-188, and W-18 , is described in section 3.1.1.2~~3~~2.

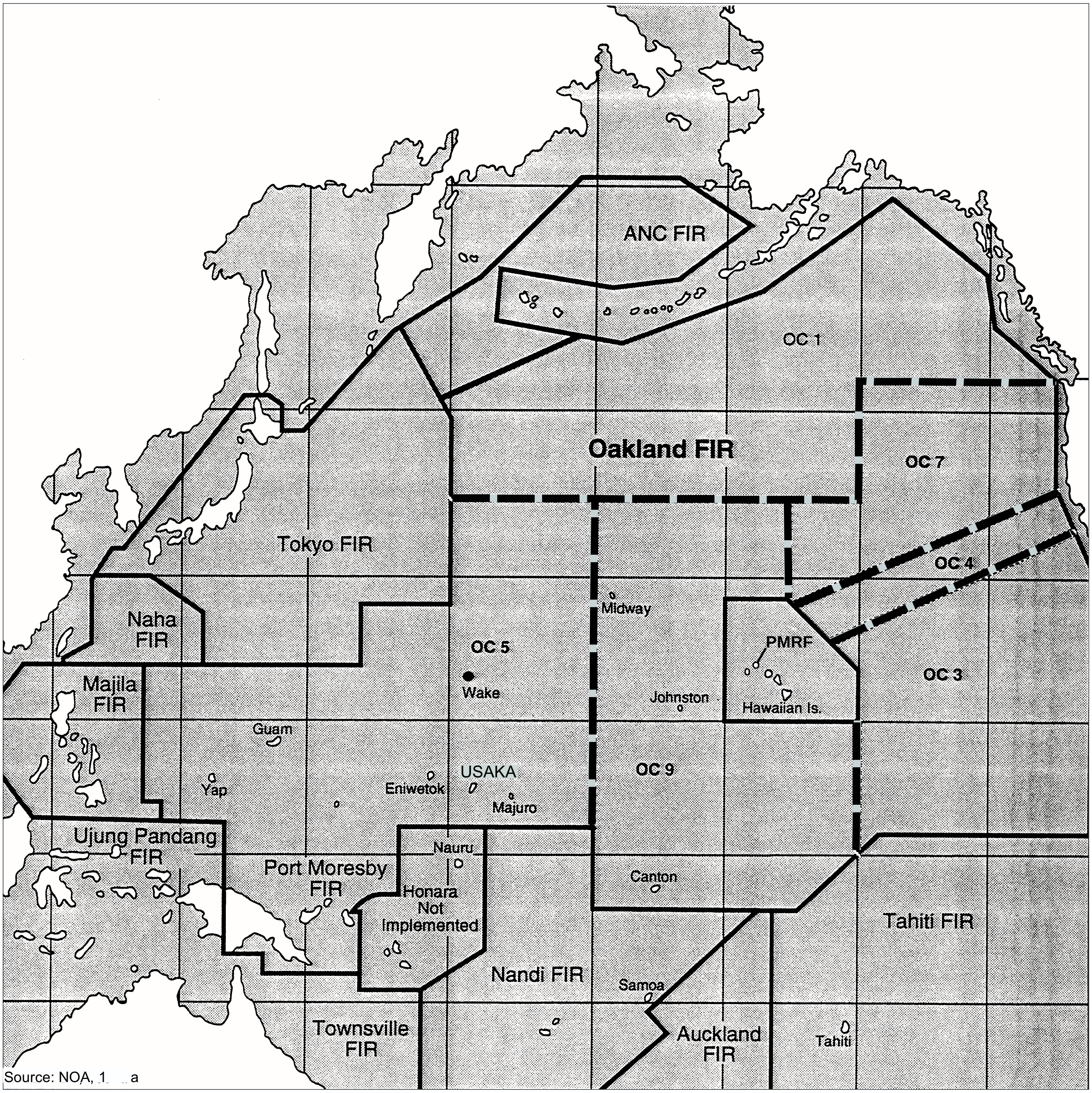
3.4.1.3.3 En Route Airways and Jet Routes

Other than the two en route low altitude airways, V1 and V1 identified in~~section~~ figure 3.1.1.2~~.~~-3, the Ocean Area airspace use region of influence has two en route high altitude et routes, A to the west, and R 8 to the southwest of Kauai, respectively (figure 3. .1-2). These et routes pass through the southern portion of the region of influence. Most of the Ocean Area airspace use region of influence is well removed from the et routes that currently crisscross the North Pacific Ocean (figure 3. .1-2).

As an alternative to aircraft flying above 8,83 m (2 , ft) following published, preferred IFR routes (shown in figure 3. .1-2), the FAA is gradually permitting aircraft to select their own routes. This Free Flight program is an innovative concept designed to enhance the safety and efficiency of the National Airspace System. The concept moves the National Airspace System from a centralized command-and-control system between pilots and air traffic controllers to a distributed system that allows pilots, whenever practical, to choose their own route and file a flight plan that follows the most efficient and economical route. (Federal Aviation Administration, 1 , Sep, p.1). 23

Free Flight calls for limiting pilot flexibility in certain situations, such as, to ensure separation at high-traffic airports and in congested airspace, to prevent unauthorized entry into special use airspace, and for any safety reason. Free Flight is being developed, tested, and implemented incrementally by the FAA and the aviation community. Safety remains the highest priority throughout the transition to full Free Flight. The annual air traffic rate is expected to grow by 3 to percent for at least the next 1 years, but the current airspace architecture and management is not able to efficiently handle this. Implementation of Free Flight, which offers benefits in system safety, capacity, and efficiency, is key to advancing aviation by accommodating the nation s growing airspace needs. (Federal Aviation Administration, 1 , Sep, p.1 through 2). 23

Free Flight is a oint initiative of the global aviation industry and the FAA. The planning has been done principally through RTCA, Inc., an organization that serves in an advisory capacity to the FAA. In 1 , RTCA formed a government and industry select committee to study Free Flight. The committee s report defined the Free Flight concept and the first



EXPLANATION

Oceanic Control Area Boundary

Sector Boundary

FIR Flight Information Region

OC Oceanic Control

PMRF Pacific Missile Range Facility

NORTH

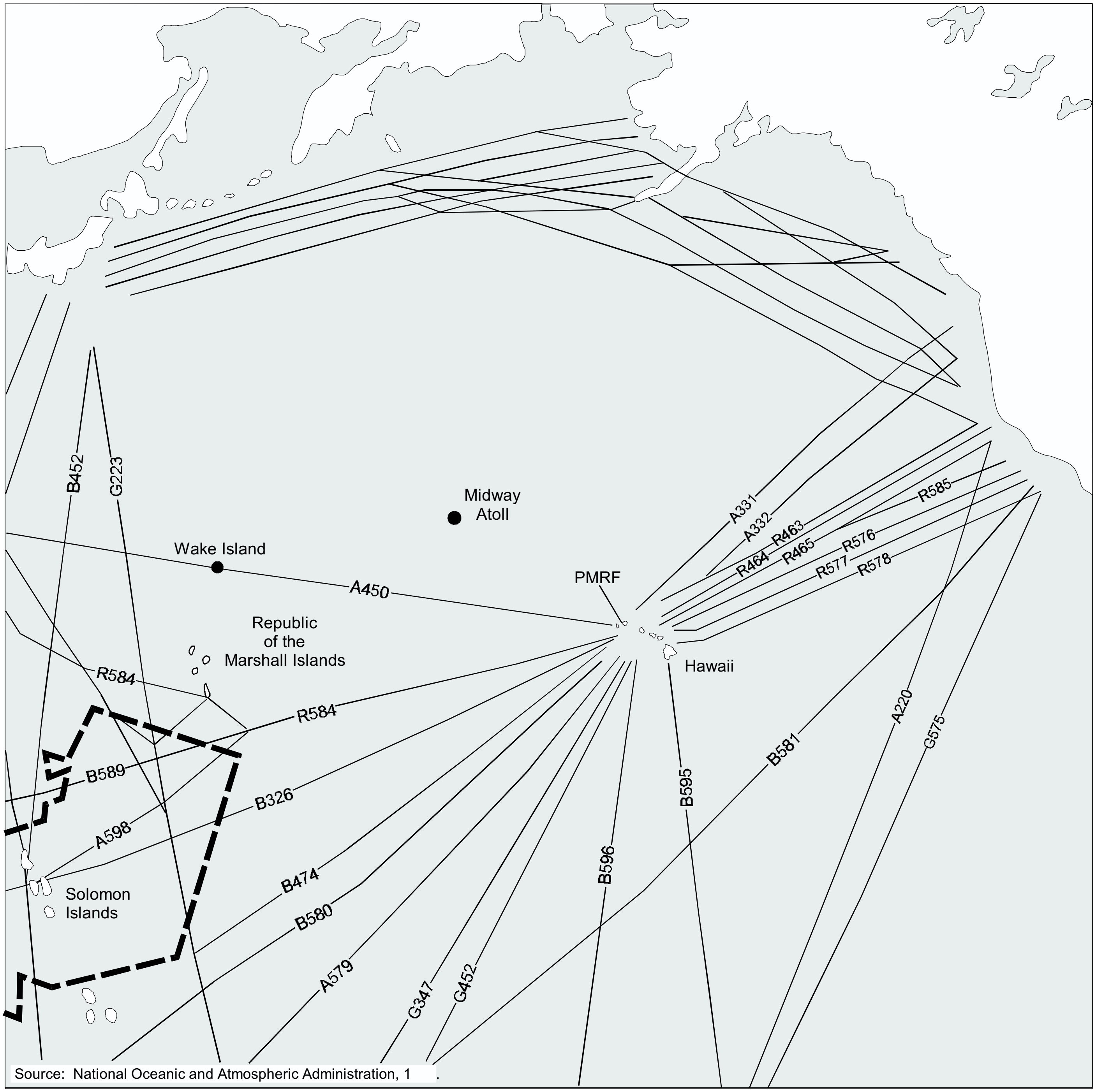
Not to Scale

Airspace Managed by Oakland Oceanic Control Area Administrative Boundaries

Ocean Area

Figure 3.4.1-1

ocean as 1



Source: National Oceanic and Atmospheric Administration, 1

EXPLANATION

– – – Uncontrolled Airspace Boundaries

PMRF Pacific Missile Range Facility

High Altitude Jet Routes, Northern Pacific Ocean

Ocean Area

Figure 3.4.1-2

steps for its implementation. In 1 , the FAA Administrator confirmed the agency s commitment to Free Flight and a seamless global air traffic management system. (Federal Aviation Administration, 1 , Sep, p.2). 23

International coordination is being accomplished through the RTCA Government/industry Free Flight Steering Committee, which contains international representation, and the FAA s membership in the ICAO. The phased approach for Free Flight, along with international aviation participation, contributes to building a seamless global airspace system. (Federal Aviation Administration, 1 , Sep, p.2). 23

Central to the Free Flight concept is the principle of maintaining safe airborne separation. This principle is based on two airspace zones, protected and alert, the sizes of which are based on the aircraft s speed, performance characteristics, and communications, navigation, and surveillance equipment. The protected zone, the one closest to the aircraft, can never meet the protected zone of another aircraft. The alert zone extends well beyond the protected zone, and aircraft can maneuver freely until alert zones touch. If alert zones do touch, a controller may provide one or both pilots with course corrections or restrictions to ensure separation. Eventually, most commands will be sent via data link, an integrated network of air, ground, and airborne communications systems. Additionally, onboard computers and Global Positioning System satellites will allow pilots, with the concurrence of controllers, to use airborne traffic displays to choose solutions. (Federal Aviation Administration, 1 , Sep, p.2). 23

Free Flight is designed to provide the user community with the flexibility to better manage its operations and the capability to benefit from advanced avionics. The requirement for users to receive benefits from the implementation of Free Flight is essential. By providing for more efficient routes, Free Flight will reduce user operating costs. Free Flight will allow the user s aircraft to reach its destination at the prescribed time. (Federal Aviation Administration, 1 , Sep, p.2). 23

Free Flight will also enable air traffic controllers to accommodate future air traffic growth through a decision support system at an affordable cost to users. By providing the user with incentives to modernize their equipment, the FAA will move to a modern infrastructure, reducing the FAA operations and maintenance burdens while increasing safety. (Federal Aviation Administration, 1 , Sep, p.2). 23

Free Flight is already underway, and the plan for full implementation will occur as procedures are modified and technologies become available and are acquired by users and service providers. This incremental approach balances the needs of the aviation community and the expected resources of both the FAA and the users. The Central Pacific Oceanic Program is one of two current Free Flight programs underway. In the airspace over the Central Pacific, advanced satellite voice and data communications are being used to provide faster and more reliable transmission to enable reductions in vertical, lateral, and longitudinal separation, more direct flights and tracks, and faster altitude clearances. (Federal Aviation Administration, 1 , Sep, p.2 through 3). With the full implementation of this program, the amount of airspace in the 23 region of influence that is likely to be clear of traffic will decrease as pilots, whenever practical, choose their own route and file a flight plan that follows the most efficient and economical route, rather than following the published preferred IFR routes across the Pacific Ocean shown in figure 3. .1-2.

3.4.1.3.4 Airports and Airfields

There are no airports or airfields in the Ocean Area airspace use region of influence.

3.4.1.3.5 Air Traffic Control

Air traffic in the region of influence is managed by the Honolulu ARTCC, and the Oakland ARTCC (see figure 3. .1-1).

3.4.2 BIOLOGICAL RESOURCES— OCEAN AREA (OUTSIDE U.S. TERRITORY)

3.4.2.1 Description of Resource

The study of marine biology of the Ocean Area ~~is concerned~~ entails ~~with~~ the animal and plant life that lives in and ust above the surface waters of the sea and its fringes, with its salient physical and chemical properties, with biological diversity, and with the characteristics of its different ecosystems or communities.

3.4.2.2 Region of Influence

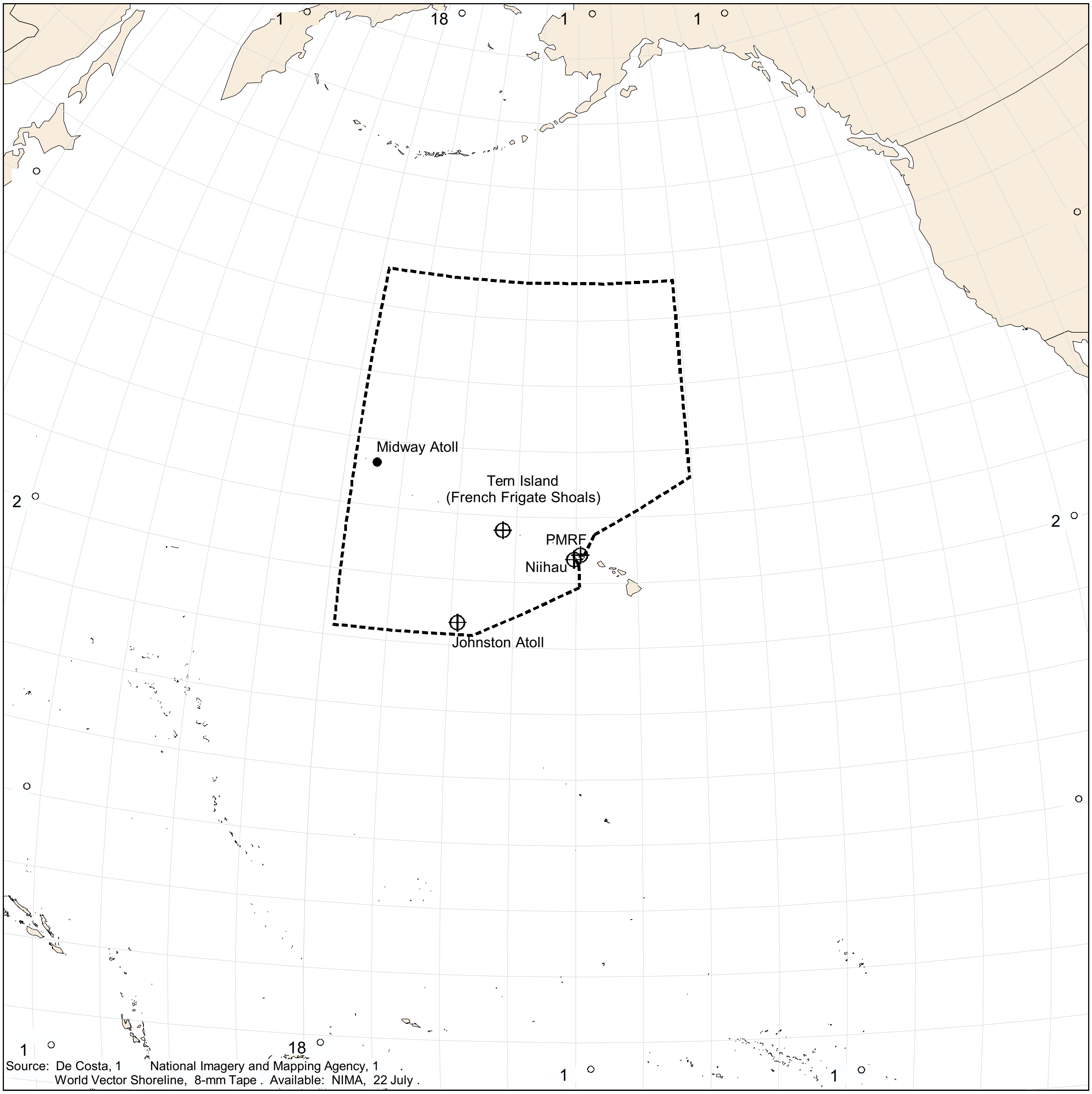
The Ocean Area region of influence occupies approximately ~~1 .~~ .1 million km^2 (~~3~~2.1 million nmi^2) in the central north Pacific Ocean, or approximately percent of the Pacific Ocean s total area (figure 3. .2-1). The ma ority of the ongoing No-action activities take place within a much smaller ~~1 ,~~ 1 , km^2 (~~,~~ 2, -nmi^2) area extending from -1 to -1 2 degrees west and 21 to 2 degrees north (figure 3. .2-2) within the broader region of influence. While the average depth of the broader Ocean Area region of influence is 3, 32m (12, ft), the smaller subarea s depth varies from less than 1 m (3, ft) around the islands of Kauai, Niihau, and Kaula, to over , 2 m (1 , ft) to the north of Kauai (figure 3. .2-2).

3.4.2.3 Affected Environment

The affected environment of the Ocean Area is described below in terms of: physical and chemical properties biological diversity principal zones (littoral, coastal, offshore, pelagic and benthic) special habitats candidate, threatened, and endangered species and other marine mammals.

3.4.2.3.1 Physical and Chemical Properties

The general composition of the ocean includes water, sodium chloride, dissolved gases, minerals, and nutrients. These characteristics determine and direct the interactions between the seawater and its inhabitants. The most important physical and chemical properties are salinity, density, temperature, pH, and dissolved gases.



18

64

EXPLANATION

------ Region of Influence

● Midway (Geographical reference only)

⊕ Candidate Sites

PMRF Pacific Missile Range Facility

Scale 1: , ,

3 1,2 Kilometers

3 3 8 Nautical Miles

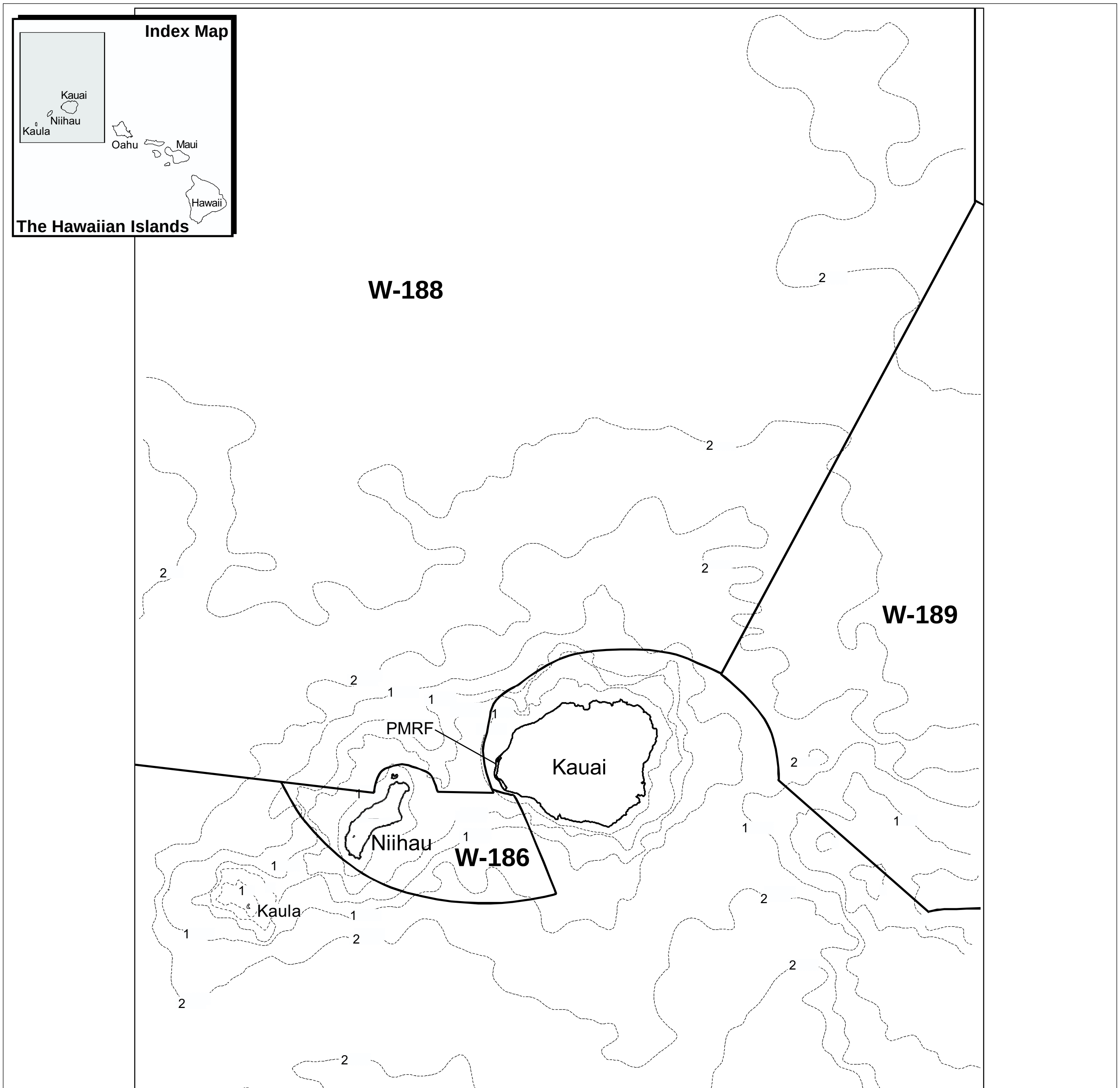
NORTH

Ocean Area Biological Resources Region of Influence - Proposed Action (Revised)

Open Ocean

Figure 3.4.2-1

ocean br 1



Source: NOAA, National Ocean Service, 1 8 , Hawaiian Islands, Northern Part Nautical Chart (1 13).

EXPLANATIONS

- ---------- Depth Contour Lines (fathoms)
- PMRF Pacific Missile Range Facility
- W Warning Area

Ocean Area Biological Resources Region of Influence - No-action Alternative (Revised)

Hawaiian Islands

Figure 3.4.2-2

Scale

2 8 Kilometers

1 3 Miles

NORTH

ocean br 2

3.4.2.3.1.1 Salinity

Salinity refers to the salt (sodium chloride) content of seawater. For oceanic waters, the salinity is approximately 3 parts of salt per 1, parts of seawater. Variations in the salinity of ocean water are linked primarily to climatic conditions. Salinity variations are at their highest at the surface of the water. The salinity of surface water is increased by the removal of water through evaporation. Alternately, it decreases through dilution from the addition of fresh water (e.g., rain, runoff from fresh water sources such as streams). Estuaries and coastal areas represent transition zones from saltwater to fresh water. Seawater salinity has a profound effect on the concentration of salts in the tissues and body fluids of organisms. Slight shifts of salt concentrations in the bodies of animals can have stressful or even fatal consequences. Therefore, animals have either evolved mechanisms to control body salt levels, or they let them rise and fall with the levels of the seawater around them. (Waller, 1 , p.3 through 38) 18

In addition to the direct effects on marine biota, salinity also has an effect on the ocean s physical properties. For example, salinity helps maintain a constant temperature throughout the ocean depths. A high salt content in water slightly increases its density, which makes it resistant to drastic temperature fluctuations.

3.4.2.3.1.2 Density

Density (mass per unit volume) of seawater is dependent upon its composition, and is affected by temperature. The dissolved salt and other dissolved substances contribute to ~~the~~ a higher density of seawater versus fresh water. As temperatures increase, density decreases. Accordingly, water that is more dense will sink, while water which is less dense will rise. Therefore, oceans can be thought of as having a three-layered system of water masses. The three layers of the ocean include: the surface layer, from to m (to 1 . ft) an intermediate layer, from 1 . to .2 m (to 1, ft) and a deep-water layer, from .2 m (1, ft) to the sea floor. (Waller, 1 , p.) 18

3.4.2.3.1.3 Temperature

Water temperature is one of the most important physical factors of the marine environment. Temperature controls the rate at which chemical reactions and biological processes occur (Waller, 1 , p.). In addition, most organisms have a distinct range of temperatures in 18 which they may thrive. A greater number of species live within the moderate temperature zones with fewer species tolerant to extremes in temperature. Typically, the vast ma ority of organisms cannot survive dramatic temperature fluctuations.

Temperature gradients are created when warmer, lighter water floats above the cold, more dense water. The warm and cold layers of water are separated by a thin, narrow band of stable water called a thermocline. In tropical latitudes, the thermocline is present as a permanent feature and is located 1 to 3 m (2 to 1, ft) below the surface. The temperature below the thermocline remains relatively constant, with most areas of the Pacific maintaining a temperature of C (3 .2 F). The thermocline acts as a depth barrier to many plants and animals and often represents the boundary between hospitable and inhospitable water masses for many species of organisms. (Waller, 1 , p. 2) 18

3.4.2.3.1.4 pH

The measure of the acidity or alkalinity of a substance, known as the pH, is based on a scale ranging from 1 (highly acidic) to 1 (highly basic). A pH of is considered neutral. Surface seawater often has a pH between 8.1 and 8.3 (slightly basic), but generally ~~the acidity of ocean water~~ is very stable with a neutral pH. In shallow seas and coastal areas, the pH can be altered by plant and animal activities, by pollution, and interaction with fresh water. (Waller, 1 ,
p.) 18

3.4.2.3.1.5 Dissolved Gases

Oxygen is not readily soluble in seawater. The amount of oxygen present in seawater will vary with the rate of production by plants, consumption by animals and plants, bacterial decomposition, and by surface interactions with the atmosphere. Most organisms require oxygen for their life processes. When surface water sinks to deeper levels, it retains its store of oxygen. (Waller, 1 , p.3) 18

Carbon dioxide is a gas required by plants for photosynthetic production of new organic matter. Carbon dioxide is times more concentrated in seawater than it is in the atmosphere. Seawater in tropical regions has lower levels of dissolved gas in a given volume of water compared to seawater in high latitude areas (Waller, 1 , p.3). 18

3.4.2.3.2 Biological Diversity

Although oceans have far fewer species of plants and animals than terrestrial and fresh water environments, an incredible variety of living things reside in the ocean. Marine life ranges from microscopic one-celled organisms to the world s largest animal, the blue whale. Ocean plants and plant-like organisms use sunlight and the minerals in seawater to grow. Sea animals eat these organisms and one another. Marine plants and plant-like organisms can live only in the sunlit surface waters of the ocean, the photic zone, which extends to only about 1 1 m (33 ft) below the surface. Beyond the photic zone, the light is insufficient to support plants and plant-like organisms. Animals, however, live throughout the ocean from the surface to the greatest depths.

Marine biological communities can be divided into two broad categories pelagic and benthic. Pelagic communities live in the water column and have little or no association with the bottom, while benthic communities live within, upon, or associated with the bottom (Thorne-Miller Catena, 1 1, p.38). 12

The organisms living in pelagic communities may be drifters (plankton) or swimmers (nekton). The plankton includes larvae of benthic species, so a pelagic species in one ecosystem may be a benthic species in another. The plankton consists of plant-like organisms (phytoplankton) and animals (zooplankton) that drift with the ocean currents, with little ability to move through the water on their own. The mostly one-celled phytoplankton float in the photic zone, where the organisms obtain sunlight and nutrients, and serve as food for the zooplankton and for some larger marine animals. The zooplankton consist of many kinds of animals, ranging from one-celled organisms to ellyfish up to 1.8 m (ft) wide, which live in both surface and deep waters of the ocean. Crustaceans make up about percent of all zooplankton. While some zooplankton float about freely throughout their lives, many spend only the early part of their lives as plankton. As adults, some become strong swimmers and oin the nekton, whereas others settle to the sea floor or attach themselves to it and become part of the benthos.

The nekton consists of animals that can swim freely in the ocean. They are strong swimmers and include fish, squids, and marine mammals. Most species of nektonic animals live near the sea surface, where food is plentiful. But many others live in the deep ocean. Fish are the most important nekton, with over 13, kinds of fish living in the ocean. Squids are free-swimming mollusks who live in both surface and deep waters. Nektonic mammals include dugongs, manatees, porpoises, and whales, all of which remain in the ocean for their entire lives. Other marine mammals, such as sea lions, sea otters, seals, and walruses, spend time on land.

Pelagic systems are thought to be controlled primarily by physical factors, including temperature, nutrients, light in the surface waters, and disturbances in the water structure. The latter occurs when winds and other atmospheric conditions drive changes in the circulation patterns of ocean waters. As a result, there are vertical changes in the temperature and nutrient distribution, which in turn affect the vertical distribution of species. There is no clear evidence of biological factors controlling species diversity in these ecosystems, but species interactions have not been well-studied (Thorne-Miller Catena, 1 1, p.3). 12

Benthic communities, or the benthos, is made up of marine organisms that live on or near the sea floor. They may burrow in the ocean floor, attach themselves to the bottom, or crawl or swim about within the bottom waters. Where sunlight can reach the sea floor, thebenthos includes plants and plant-like organisms, such as kelp and sea grass, which become anchored to the bottom. Among the common animals that live on the sea floor are clams, crabs, lobsters, starfish, and several types of worms. Halibut and sole are among some fish that have adapted to life on the ocean floor. Barnacles, clams, oysters, and various snails and worms are among the animals that begin life as zooplankton, but on reaching maturity sink to the sea floor and become part of the benthos.

The greatest known diversity of marine species exists in benthic communities, especially in coral reefs and on the deep-ocean floor. The benthic environment includes the intertidal shore, the shallow subtidal or continental shelf, the continental slope, the deep abyssal plains, and isolated ecosystems such as coral reefs, seamounts, and deep-sea trenches. The substrate may vary considerably, with distinct differences between hard-bottom and soft-bottom communities. The type of bottom has a pronounced effect on the nature of the community that lives there. Beyond that single physical factor, species diversity is maintained by biological mechanisms competition, predation, larval recruitment, and biological structuring of the substrate and/or physical mechanisms, such as nutrients, light, waves, and currents (Thorne-Miller Catena, 1 1, p.3). 12

3.4.2.3.3 Ocean Zones

Classification of the Pacific Ocean zones is based upon depth and proximity to land. Using this methodology, there are four ma or divisions or zones in the ocean the littoral zone, the coastal zone, the offshore zone, and the pelagic zone. Spanning across all zones is the benthic environment, or sea floor. This section discusses the pelagic zone and the benthic environment. The littoral, coastal, and offshore zones are discussed in section 3.1.1.3.2.

3.4.2.3.3.1 Pelagic Zone

The pelagic zone is commonly referred to as the open ocean. The organisms which inhabit the open oceans typically do not come near land, continental shelves, or the seabed (Waller, 1 ,
p. 3). Approximately 2 percent of marine species live in the open oceans (Hickman, Roberts 18
and Hickman, 1 , p.12). Pelagic communities are composed of plankton and nekton, with 3
highly varied life forms. While species diversity within these ecosystems has been studied for individual groups of animals, especially zooplankton, it has not been studied for the entire community. The open-ocean pelagic systems are physically defined by large stable circulation patterns, such as the large-scale gyres. The gyres circumscribe horizontal areas, but the systems are also vertically stratified, with characteristic plankton and nekton diversities at several depth intervals defined by physical gradients (Thorne-Miller Catena, 1 1, p.). 12

The region of influence lies at the southern edge of the central North Pacific anticyclonic gyre, which is characterized by sinking waters in the interior, due to an inverted halocline, and by higher temperatures in the upper stratum. It is a relatively homogeneous, non-seasonal system of low production but high diversity the most species-rich province in the Pacific (Thorne-Miller
Catena, 1 1, p. 8). 12

3.4.2.3.3.2 Benthic Zone

Finally, the bottom of the sea floor is known as the benthic area. It comprises 8 percent of the species of animals and plants in the ocean. Of the benthic forms, most occur in the intertidal zone or shallow depths of the oceans. Less than 1 percent of benthic species live in the deep
ocean below 2, m (, 2 ft) (Hickman, Roberts and Hickman, 1 , p.12). The coastal 3
benthic communities were described briefly in section 3.1.1.3.2 for the littoral, coastal, and off-shore zones, and for coral reefs in the coastal zone. The deep-sea benthic community, which lives a thousand to several thousand meters beneath open ocean waters, has been stable over long periods of geologic time and has allowed for the evolution of numerous highly specialized species. The diversity of the larger faunal species increases with depth to a maximum found at an intermediate depth, and then decreases with increasing distance seaward on the abyssal plain. The smaller fauna appear to reach a maximum diversity somewhat deeper (Thorne-Miller
Catena, 1 1, p. 1). 12

3.4.2.3.4 Special Habitats

Critical habitat for Hawaiian monk seals (CFR 22) is in the northwest Hawaiian Islands from Kure to Niihau within the 3 . -m (2 -fathom) contour from the beaches.

3.4.2.3.5 Candidate, Threatened, and Endangered Species

Several species found in the Ocean Area region of influence are listed by the Endangered Species Act as candidate species, threatened species, and endangered species. This classification is based upon the population of the species. To be categorized as a candidate species, the species is recognized as a potential threatened or endangered species. It is also noted as a Federal Notice of Review species. To be classified as threatened, a species is found to be likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range.

The same nine species identified in section 3.1.1.3.2 as threatened and endangered also exist in the Ocean Area region of influence.

3.4.3 HEALTH AND SAFETY— OCEAN AREA (OUTSIDE U.S. TERRITORY)

3.4.3.1 Description of Resource

A description of the resource is given in section 3.1.1. .

3.4.3.2 Region of Influence

The Ocean Area region of influence is defined as that area that would be affected by the ongoing No-action Alternative and would be potentially affected by the Proposed Action.

3.4.3.3 Affected Environment

The affected health and safety environment for the Ocean Area is described below in terms of its principal attributes, namely: range control procedures and verification of Ocean Area clearance procedures.

Range Control is charged with surveillance, clearance, and real-time range safety. The Range Control Officer using PMRF assets is solely responsible for determining range status and setting RED (no firing) and GREEN (range is clear and support units are ready to begin the event) range firing conditions. The Range Safety Approval and the Range Safety Operation Plan documents are required for all weapons systems using PMRF (U.S. Department of Defense, 1 1, Sept, p.3). PMRF uses RCC 321- ,*Common Risk Criteria for National Test* 148
Ranges. RCC 321- sets requirements for minimally-acceptable risk criteria to occupational and non-occupational personnel, test facilities, and non-military assets during range operations. Under RCC 321- , individuals of the general public shall not be exposed to a probability of fatality greater than 1 in 1 million for any single mission and 1 in 1 million on an annual basis (Range Commander Council, 1 , 12 Feb, p.3-)

Range Safety officials ensure operational safety for pro ectiles, targets, missiles, and other hazardous operations into PMRF operational areas. The operational areas consist of two Warning Areas (W-18 and W-188) and one Restricted Area (R-31 1) under the local control of PMRF. The Warning Areas are in international waters and are not restricted however, the surface area of the Warning Areas is listed as HOT (actively in use) 2 hours a day. For special operations, multi-participant or hazardous weekend firings, PMRF publishes dedicated warning NOTAMs and NOTMARs.

The range safety clearance procedures at PMRF are some of the most rigorous because of the extra sensors available. Before an operation is allowed to proceed, the range is verified cleared of non-participants using inputs from ship sensors, visual surveillance of the range from aircraft and range safety boats, radar data, and acoustic information from a comprehensive system of the sensors and surveillance from shore. If whales are present in the operations areas, activities are stopped until the mammals have cleared the area. In addition, all activities must be in compliance with DOD Directive .1 (as enclosed by OPNAVINST 3 . A, *Use of Airspace by U.S. Military Aircrafts and Firing Over the High Seas*, dated 23 March 1 81) which specifies procedures for conducting aircraft operations and for missile/pro ectile firing, namely: the missile/pro ectile firing areas shall be selected so that tra ectories are clear of established oceanic air routes or areas of known surface or air activity.

3.4.4 TRANSPORTATION— OCEAN AREA (OUTSIDE U.S. TERRITORY)

3.4.4.1 Description of Resource

Transportation, in this case, addresses commercial shipping and its passage through the region of influence. Commercial shipping is defined here as the conveyance of freight, commodities, and passengers in mercantile vessels across areas of the Pacific Ocean.

3.4.4.2 Region of Influence

The region of influence is defined as that area of the northern Pacific Ocean that would be affected by the No-action Alternative and the Proposed Action and through which commercial shipping would pass.

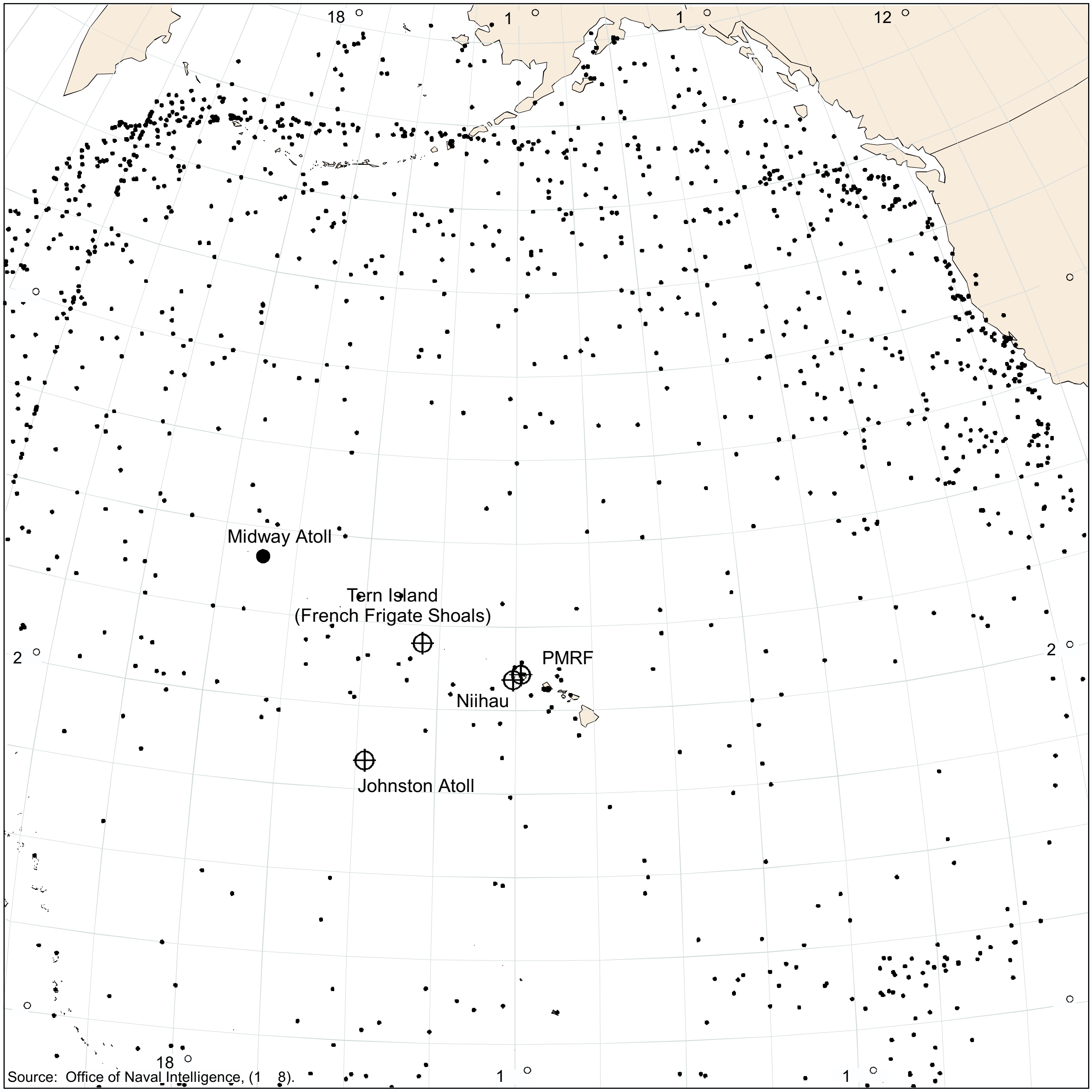
3.4.4.3 Affected Environment

The northern Pacific is an important commercial seaway, carrying a substantial proportion of the United States trade in raw materials and finished products. In 1 , about 21 percent of all commercial vessels importing and exporting goods to and from the U.S. top 3 ports departed from, or were bound for, ports on the U.S. Pacific seaboard (U.S. Department of Commerce, Bureau of Census, Foreign Trade Division, undated, 1 Vessel Movement). The large ma ority of these vessels crossed the northern Pacific Ocean, to and from the large trading ports of Asia.

There are no regulations or directions obliging commercial vessels to ply specific cross-ocean lanes. Once it has left the navigation lanes leading out to the open sea, the ma ority of shipping will follow the course of least distance between two ports.

A composite snapshot of shipping in the northern Pacific, generated from satellite data for the busiest months of the year, is shown in figure 3. . -1. It shows the number of ships traveling across the northern Pacific in August 1 , with each ship identified and located once. The figure includes cargo vessels, tankers, passenger ships, and fishing vessels, and characterizes the random nature of commercial shipping movements in the northern Pacific.

The data shows that, while there is a general adherence to particular routes (such as the great circles of latitude between the United States to Asian ports), commercial vessels plot a diverse range of courses across the northern Pacific. This was confirmed by the National



Source: Office of Naval Intelligence, (1 8).

EXPLANATION

- Ship
- Midway (Geographical reference only)
- Candidate Sites

NORTH

Scale

33 8 Kilometers

23 8 Nautical Miles

Composite Snapshot of Ship Locations in the Northern Pacific (Revised)

Open Ocean

Figure 3.4.4-1

ocean tp 1

Imagery and Mapping Agency, which stated that it no longer published shipping routes for the northern Pacific for precisely this reason.

3.4.5 WATER RESOURCES— OCEAN AREA (OUTSIDE U.S. TERRITORY)

Water quality in the open ocean is excellent, with high water clarity, low concentrations of suspended matter, dissolved oxygen concentrations at or near saturation, and low concentrations of contaminants such as trace metals and hydrocarbons. A description of the open ocean s physical and chemical properties, including salinity, density, temperature, pH, and dissolved gases, is given in section 3. .2.~~-~~3.

3.5 ENVIRONMENTAL JUSTICE

3.5.1 BACKGROUND

An Environmental Justice analysis is included in this document to comply with the intent of EO 128 8, Army, and DOD guidance. The ob ectives of the EO include development of Federal agency implementation strategies and identification of potential human health or environmental effects that could have significant and disproportionately adverse effects on low-income and minority populations potentially impacted from proposed Federal actions. In addition, the EO requires that minority and low-income populations be given access to information and opportunities to provide input to decisionmaking on Federal-actions. Accompanying EO 128 8 was a Presidential Transmittal Memorandum that referenced existing Federal statutes and regulations to be used in con unction with EO 128 8. One of the Federal statutes referenced was NEPA. Specifically, the memorandum indicates that, Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 2 U.S.C. section 321 et.seq.

The Environmental Justice discussion is divided into two sections: (1) a description of the methodology, and (2) a description of the public outreach program that is being conducted by the Navy. For an overview of the environmental and socioeconomic conditions on the islands of Kauai and Niihau, see the appropriate locations under PMRF/Main Base (section 3.1.1) and Niihau (section 3.2.1).

3.5.2 METHODOLOGY

Most of the environmental effects from the No-action Alternative and Proposed Action are anticipated to occur in Kauai County (which includesNiihau), which is the region of influence for the Environmental Justice analysis. In developing statistics for the 1 Census of Population and Housing, the U.S. Department of Commerce, Bureau of Census, identified small subdivisions used to group statistical census data. In metropolitan areas, these subdivisions are known as census tracts.

Tables for the 1 Census of Population and Housing were used to extract data on low-income and minority populations in census tracts in Kauai County. The census reports both on minority and poverty status. Minority populations included in the census are identified as Black American Indian, Eskimo or Aleut Asian or Pacific Islander Hispanic or other. Because of the multi-cultural nature of Kauai County and because the Census Bureau does not differentiate between cultural groups making up the Asianor Pacific Islanders population, this analysis is limited by these conditions. Poverty status (used in this EIS to define low-income status) is reported as the number of families with income below poverty level (12, for a family of four in 1 8 , as reported in the 1 Census of Population and Housing).

A census tract is considered disproportionate under either of two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in Kauai County, the region of comparison, or (2) the percentage of low-income or minority populations in the census tracts exceeds percent. Data for each census tract were compared to data for the regional political urisdiction surrounding the tract. For this analysis, the region of comparison was defined as Kauai County. Therefore, Kauai County was used as the region of influence for the Environmental Justice analysis. Based upon the 1 Census of Population and Housing, Kauai County had a population of 1,1 . Of that total, 3, persons, or .2 percent, were low-income and 3 , persons, or 8.3 percent, were minority.

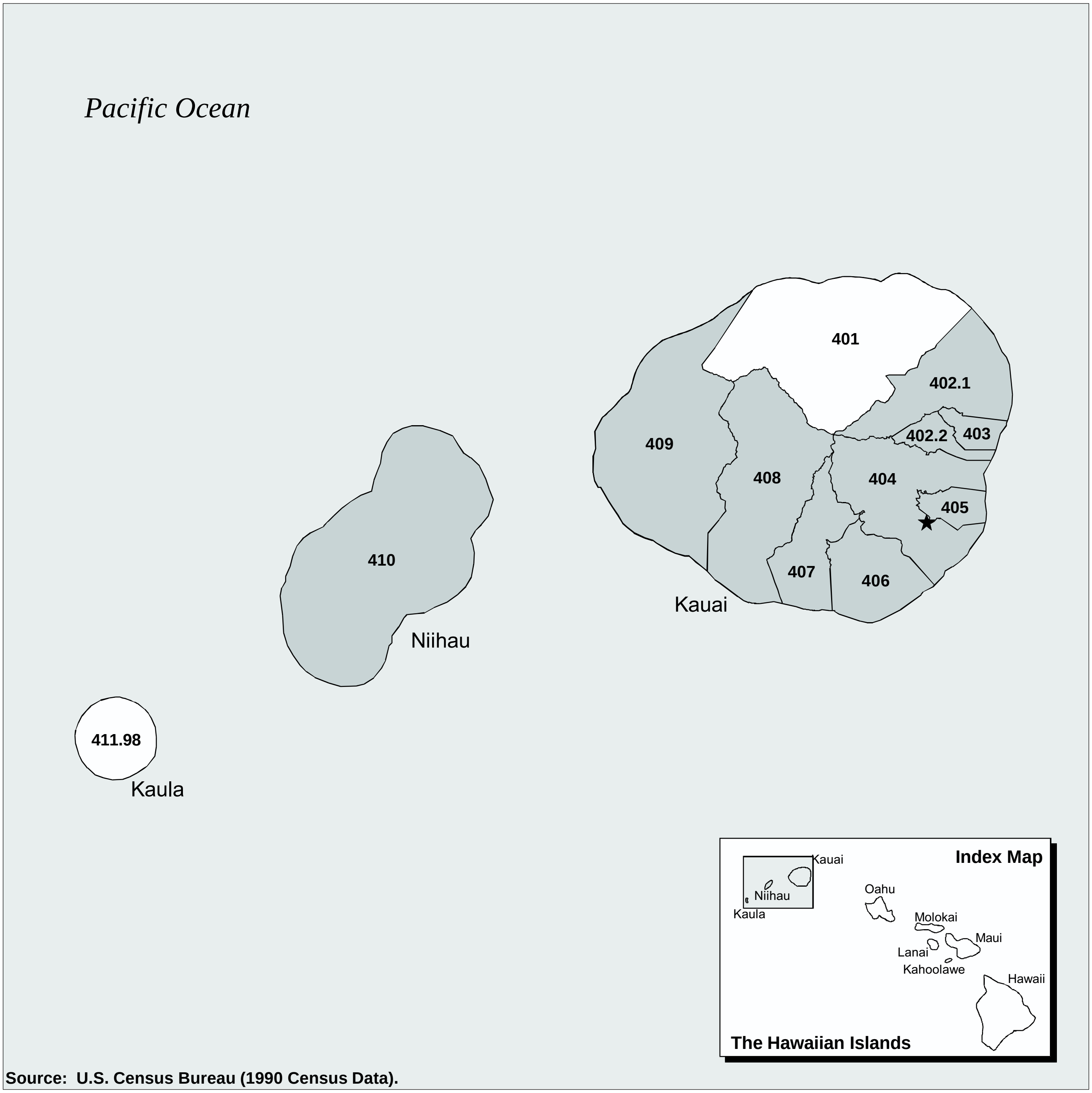
Kauai County is subdivided into 13 census tracts, of which 1 have a disproportionate percentage of low-income or minority populations (or both), as shown in figure 3. .2-1 and table 3. .2-1. These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be sub ect to Environmental Justice impacts. Census Tract includes PMRF and the surrounding area and would be sub ect to most of the effects from base operations.

Additionally, table 3. .2-2 provides a further breakdown of each census tract by race. The minority groups are considered Black, American Indian or Aleut, Asian or Pacific Islander, Hispanic, or other race as defined by the U.S. Bureau of the Census. Within the County of Kauai the largest group is Asian or Pacific Islander. Census tract 1 , which is 1 percent Asian or Pacific Islander, is the Island of Niihau.

For Niihau, reliance on U.S. Bureau of the Census data is problematic, both due to small sub-sample size and to poor fit between some main line census indicators and Niihau material and cultural circumstance. However, census data was used since it is the only data available. It is clear, however, that the Niihau population approaches 1 percent Hawaiian ethnicity, and is the type of ethnic sub-population that the Environmental Justice guidelines are designed to ~~deal with~~address.

Since proposed pro ect activities could have adverse consequences for Niihau residents if not properly mitigated, an Environmental Justice discussion for Niihau is included in this report. As required by Environmental Justice guidelines, this discussion will consider both existing circumstances on Niihau, and the evolution of historic factors leading to present-day conditions.

Section 3.2.1.1 has already provided some socioeconomic data on Niihau. This section will integrate those data with information on cultural circumstance. Culture relates to how Niihauans live, and is consequently distinguished from the cultural resources analysis included elsewhere in this report.



142

EXPLANATION

401 = Census Tract

★ = Census Tract .

Disproportionately High Low Income or Minority Census Tract

Kauai County Census Tracts

Kauai County, Hawaii

Figure 3.5.2-1

NORTH

Scale

11.3 22. Kilometers

1 Miles

kauai e 1

Table 3.5.2-1: Census Tracts in Kauai County

	Percent Minority	Disproportionately High	Percent Low Income	Disproportionately High
United States	2 .2	--	13.12	--
Hawaii	8. 1	--	8.2	--
Kauai County	8.32	--	.21	--
Census Tracts				
1	3 .	No	. 8	No
2.1	.12	es	.	es
2.2	. 2	es	.	No
3	1. 8	es	1 .	es
	8 . 8	es	.	es
	2. 3	es	.	No
.	N/A	No	N/A	No
	2. 2	es	.8	No
	.2	es	.8	No
8	88.3	es	.81	No
	. 8	es	1 .	es
1 (Niihau)	1	es	. 1	es
11. 8	N/A	No	N/A	No

Source: U.S. Census Bureau, 1 8. 142
Data presented for comparison purposes.
There is no population within census tracts . and 11. 8
N/A Not Applicable

Table 3.5.2-2: Race by Census Tract, Kauai County

Census Tract	White	Minority Groups: Black	American Indian or Aleut	Asian or Pacific Islander	Hispani c	Other Race
1	2, 32		2	1,311	1 2	
2	8	N/A	1	1, 2	31	2
2.2	2, 1	3	3	3, 2	1	2
3	1, 8	31	1	,3 3	2 8	11
	3	23		,2 8	1	1 8
	1, 8	N/A	8	3, 3	11	1
.	N/A	N/A	N/A	N/A	N/A	N/A
	1,8	8	11	2,	1 3	1
	2,31	18	13	3,	22	1 2
8	33	N/A	N/A	2, 18		32
	1,1 1	21		,282	113	1
1 (Niihau)	N/A	N/A	N/A	2	N/A	N/A
11. 8	N/A	N/A	N/A	N/A	N/A	N/A

Source: U.S. Census Bureau, 1 8. 142
There is no population within census tracts . and 11. 8
N/A Not Applicable

Residents of Niihau are a group of Hawaiian people who have been able to exercise sufficient control over their lives so that they have retained their Hawaiian language and customs, as they evolve from historic times to the present. This ability to make Niihauan choices is principally based on a resource base sufficient to sustain life on the island a human population with strong feelings of self-worth, cohesive socioeconomic ob ectives, and close social interaction an island infrastructure that ensures substantial self-control over rights and responsibilities and protection from outsiders who are not party to the community compact (Meyer, 1 8, p.11). Protection is enhanced by the power of the intact Hawaiian culture protected by their language, and by the protections provided by the owner of the island the Robinson family. (Meyer, 1 8, p.3)

Economic, social, and cultural circumstances on Niihau are interrelated, and each displays a different rate of evolution. Language plays a key role in protecting cultural knowledge and power, and Niihau is 1 percent Hawaiian speaking. (Meyer, 1 8, p.)

Niihau is arid, making survival difficult. Over the past century, the principle elements of material survival have been subsistence fishing in Niihau s near-shore area and the economic activities of Niihau Ranch. Traditional ranch activities concentrated on cattle and sheep, and on production of charcoal and honey. Islanders are also involved in arts and crafts principally the making of Niihau shell leis. Between 1 and 1 , these material and cultural activities supported a population between 222 and 2 persons. At peak, the ranch employed up to persons. (Meyer, 1 8, p.83)

In recent times, reliance on traditional activities has become more difficult. Fishing in the Niihau near-shore area by persons not living on Niihau has significantly depressed the subsistence fisheries upon which Niihau residents depend (Meyer, 1 8, p. through 1). Depressed market conditions for livestock, together with parasite and pest problems, have reduced Niihau ranching activities until today, only about 1 persons are employed. As a result, Niihau has sought to find new activities that could capitalize on the island s unique circumstances, and generate revenue and obs in a manner consistent with continued island control of lifeways. The two ma or new activity undertakings on the island are guided hunting and tourism, and contracting with the military. Hunters and tourists are brought to the island by a Niihau Ranch helicopter and closely guided and controlled by Niihau guides while on-island to guard against disruption of islander lifestyle. This activity provides significant revenue support for Niihau s helicopter and some work for island residents. By itself, it is insufficient to make up revenue and obs lost to decline of traditional Niihau economic activities.

Joint activity with the U.S. military began on Niihau prior to World War II, and has continued to the present (Meyer, 1 8, p.8). Ongoing programs generated over , for Niihau transport services in 1 and provided obs for Niihau support personnel. These ongoing programs are described in prior sections of this report. The key requirements from the perspective of Niihau residents are that such programs generate revenue and obs for the island, and that they not disrupt Niihau living and culture. Military transit to and from Niihau must use the Niihau Ranch barge and helicopter, whenever these are available. Residents of Niihau must be employed for on-island support services.

Protections for the island are formalized in a written protocol between the Navy and Niihau Ranch. This protocol requires:

- Coordination of all military entries to the island with Niihau Ranch
- Escort of military personnel by Niihau representatives while on the island
- No go zones to protect Puuwai village and other areas frequented by Niihau residents
- No smoking, alcohol, or firearms permitted
- No removals from Niihau, save for garbage and other waste
- No support services on Sunday
- No site alteration without permission
- No introduction of foreign pests or plants

When directly asked, Niihau residents reaction to these existing programs and protection protocols has been positive (Meyer, 1 8, p. 3).

3.5.3 PUBLIC OUTREACH

A public outreach program ~~is~~ was being conducted by the Navy to ensure that members of the public, including members of low-income and minority groups in Kauai County ~~are~~ were aware of ~~the~~ this EIS and the opportunities that ~~are~~ were available to the public to express concerns and comments about potential effects of the proposed alternatives.

Four public scoping meetings were held in Hawaii from 1 23 June 1 . An information meeting was also held with the residents of Niihau on 2 June 1 . Table 3. .3-1 lists the locations and dates of these meetings.

Table 3.5.3-1: Meeting Locations, Dates, and Times During the Scoping Process

Meeting Location	Date	Times
Waimea, Kauai, Waimea Neighborhood Center	1 June 1	: 8: p.m.
Kilauea, Kauai, Kilauea Neighborhood Center	1 June 1	: 8: p.m.
Lihue, Kauai, Wilcox Elementary School Cafeteria	21 June 1	1: : p.m.
Honolulu, Oahu, Assembly Hall Fort Shafter Flats U.S. Army Reserve Center	23 June 1	: 8: p.m.
Niihau	2 June 1	: 11: a.m.

Handouts were available for the public at the registration table at the scoping meetings. Informational materials included instructions on how to be heard and how to get more information, written comment sheets, cards for commentor registration and document mailing list, and several fact sheets from PMRF.

After visiting the registration area, the public was encouraged to view the staffed exhibit area. The layout of the exhibit area was designed to facilitate an open and relaxed atmosphere for communication between the public and the technical representatives. Face to face communication was the key of the presentation of the program. Five tabletop exhibits displayed key topics regarding the No-action Alternative and the Proposed Action.

An information meeting was conducted by the Navy at Puuwai, Niihau, on 2   June 1   , to present information on the Proposed Action and to receive comment~~arys~~s. This meeting was conducted with the cooperation of Niihau leaders and the Robinson family, and was designed to facilitate both formal and informal discussion with Niihau residents on the issues of particular interest to the residents of Niihau such as Niihau socioeconomic information. An extensive discussion occurred. Some Niihau residents also traveled to Kauai and attended the public scoping meetings held there.

This approach ~~will be~~ was repeated on 23 April 1   8 ~~during~~ after the Draft EIS ~~process~~ was published. Some Niihau residents also traveled to Waimea, Kauai, and Honolulu, Oahu, on 2   and 28 April 1   8 to attend~~ed~~ public ~~outreach meetings~~hearings held there. Table 3. . -2 lists the locations and dates of the meetings during the comment period.

Table 3.5.3-2: Meeting Locations, Dates, and Times During the Draft EIS Comment Period

Meeting Location	Date	Time
Niihau	23 April 1 8	: -11: a.m.
Waimea, Kauai, Waimea United Church of Christ Education Center	2 April 1 8	1 : a.m.- : p.m.
Honolulu, Oahu, Disabled American Veterans Hall	28 April 1 8	: - : p.m.

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Ref. No.	Reference	Page #	¶	Line
152	U.S. Department of Energy, 1992. *Kauai Test Facility (KTF) Environmental Assessment*, Albuquerque Operation, July. (Table 4.1.1.1-1)	4-3		
181	White Sands Missile Range, 1992. *Draft Environmental Assessment for the HAWK Missile Program, White Sands Missile Range, New Mexico,* Environmental Services Division, Report No. EA-300-24, 23 December. (Table 4.1.1.1-1)	4-3		
134	U.S. Army Space and Strategic Defense Command, 1995. *Launch Vehicles Reference Guide, Revision 3,* Test and Evaluation Office (CSSD-TE), January. (Table 4.1.1.1-1)	4-3		
33	Hiers, R.S., III, 1997. Personal communication between R.S. Hiers, III, Advanced Missile Signature Center, Arnold Air Force Base, and Gail Sikes, U.S. Army Space and Strategic Defense Command, on Liquid Rocket Exhaust Products, 15 December. (Table 4.1.1.1-3)	4-7		
152	U.S. Department of Energy, 1992. *Kauai Test Facility (KTF) Environmental Assessment*, Albuquerque Operation, July. (Table 4.1.1.1-3)	4-7		
132	U.S. Army Space and Strategic Defense Command, 1994. *Theater Missile Defense Extended Test Range Draft Environmental Impact Statement*, *Volume II*, January. (Table 4.1.1.1-3)	4-7		
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139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February. (Table 4.1.1.1-4)	4-7		
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114	Strategic Defense Initiative Organization, 1991. *Environmental Assessment, Zest Flight Test Experiment, Kauai Test Facility, Hawaii*, July. (Table 4.1.1.1-4)	4-7		
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139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February. (Table 4.1.1.1-4)	4-7		
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-12	4	3
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139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-13	1	1
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-13	3	5
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-14	5	3
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement*	4-14	8	6

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	For the Strategic Target System, February.			
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-15	2	9
166	U.S. Department of the Navy, 1995. *Report on Military Activities in Hawaiian Waters*, 21 April	4-16	4	2
22	EDAW, 1997. Site visit report by EDAW, Inc., concerning trip to Niihau and Kauai, 25 November.	4-17	1	16
57	Mobley, Jr., J.R., 1997. *Marine Mammals in Hawaiian Waters: Results of 1993-95 Aerial Surveys*, 4 December.	4-17	5	4
166	U.S. Department of the Navy, 1995. *Report on Military Activities in Hawaiian Waters*, 21 April	4-18	2	8
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-22	7	1
129	U.S. Army Space and Strategic Defense Command, 1993. *Programmatic Environmental Assessment Theater Missile Defense Lethality Program*, August.	4-22	7	2
98	Sandia National Laboratories, 1992. *Preliminary Final Environmental Assessment for the Kauai Test Facility*, July.	4-22	7	3
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-23	2	9
213	U.S. Army Program Executive Office, Missile Defense, 1993. *Ground Based Radar (GBR) Family of Strategic and Theater Radars Environmental Assessment,* June. Listed as: Durney, et al, 1986.	4-24	4	8
130	U.S. Army Space and Strategic Defense Command, 1993. *Final Environmental Impact Statement for the Restrictive Easement, Kauai,*	4-25	3	3

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167	U.S. Department of the Navy, 1996. *Cultural Resources Management Overview Survey Pacific Missile Range Facility, Hawaiian Area, Kauai, Hawaii,* Pacific Division, Naval Facilities Engineering Command, August.	4-25	3	5
140	U.S. Army Strategic Defense Command, 1993. *Hawaii Cultural and Historical Survey of Nohili, Mana, Kona District, Island of Kauai, State of Hawaii*, July. Should be: Advanced Sciences, Inc., 1993. *Hawaiian Cultural and Historical Survey of Nohili*, Mana Kona *District, Island of Kauai, State of Hawaii, Revised,* July.	4-26	6	5
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-27	3	4
169	U.S. Department of the Navy, Naval Facilities Engineering Command, Pearl Harbor, 1996. *Environmental Baseline Study, Pacific Missile Range Facility, Second Working Copy,* January. (**for official use only**).	4-27	4	4
152	U.S. Department of Energy, 1992. *Kauai Test Facility (KTF) Environmental Assessment*, Albuquerque Operation, July	4-27	4	5
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-28	4	6
135	U.S. Army Space and Strategic Defense Command, 1995. *U.S. Army Kwajalein Atoll Temporary Extended Test Range Preliminary Final Environmental Assessment,* 24 May.	4-29	1	2
135	U.S. Army Space and Strategic Defense Command, 1995. *U.S. Army Kwajalein Atoll Temporary Extended Test Range Preliminary Final Environmental Assessment,* 24 May.	4-29	2	2
135	U.S. Army Space and Strategic Defense Command, 1995. *U.S. Army Kwajalein Atoll Temporary Extended Test Range Preliminary*	4-29	2	4

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139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-30	1	4
98	Sandia National Laboratories, 1992. *Preliminary Final Environmental Assessment for the Kauai Test Facility*, July.	4-30	1	5
114	Strategic Defense Initiative Organization, 1991. *Environmental Assessment, Zest Flight Test Experiment, Kauai Test Facility, Hawaii*, July.	4-30	1	5
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-34	2	6
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-34	3	14
114	Strategic Defense Initiative Organization, 1991. *Environmental Assessment, Zest Flight Test Experiment, Kauai Test Facility, Hawaii*, July.	4-34	3	15
94	Range Commanders Council, 1997. *Common Risk Criteria for National Test Ranges Inert Debris*, 12 February.	4-35	1	2
51	Lopez, A., 1996. Personal communication between Alonzo A. Lopez, Senior Member of Technical Staff, Sandia National Laboratories, Albuquerque, New Mexico, and Quent Gillard, EDAW, Inc., 10 December.	4-35	4	7
50	Lawshe, J., 1996. Personal communication between James S. Lawshe, Senior Systems Engineer, High Technology Solutions, Inc., and Quent Gillard, EDAW, Inc., regarding comments on the 18 November 1996 DOPAA and including an enclosure of graphics, 10 December. (Figure 4.1.1.7-2)	4-37		
50	Lawshe, J., 1996. Personal communication between James S. Lawshe, Senior Systems Engineer, High Technology Solutions, Inc., and	4-38		

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114	Strategic Defense Initiative Organization, 1991. *Environmental Assessment, Zest Flight Test Experiment, Kauai Test Facility, Hawaii*, July.	4-39	2	10
139	U.S. Army Strategic Defense Command, 1992. *Draft Environmental Impact Statement For the Strategic Target System*, February.	4-39	3	9
114	Strategic Defense Initiative Organization, 1991. *Environmental Assessment, Zest Flight Test Experiment, Kauai Test Facility, Hawaii*, July.	4-39	3	9
164	U.S. Department of the Navy, 1990. *Master Plan PACMISRANFAC HAWAREA, Barking Sands, Kauai, Hawaii,* Pacific Division, Naval Facilities Engineering Command, Facilities Planning Department, Pearl Harbor, Hawaii, October.	4-42	4	8
169	U.S. Department of the Navy, Naval Facilities Engineering Command, Pearl Harbor, 1996. *Environmental Baseline Study, Pacific Missile Range Facility, Second Working Copy,* January. (**for official use only**).	4-44	4	13
98	Sandia National Laboratories, 1992. *Preliminary Final Environmental Assessment for the Kauai Test Facility*, July.	4-44	4	13
217	Department of the Air Force, 1997.. *Final Theater Ballistic Missile Targets Programmatic Environmental Assessment, Vandenberg Air Force Base*, *California*, 1 December. Replaces BMDO (mistake) in main reference list.	4-47	3	15
186	Ballistic Missile Defense Organization, 1998. *Final Theater Ballistic Missile Targets Programmatic Environmental Assessment,*	4-48	1	2

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4.0 Environmental Consequences and Mitigation Measures

4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

This section describes potential environmental consequences at each location that may be affected by the No-action Alternative and the Proposed Action, along with the identification of potential cumulative impacts and mitigation measures at the end of each section. The same resource areas used in section 3 for each location are considered in this chapter. The following sections address the potential for impacts to each environmental resource and its attributes by activity and subactivities identified in chapter 2. The rationale for not addressing certain resources for a given location is provided in appendix D. Impacts under NEPA are discussed in sections .1 through .3. Impacts under EO 1211 are discussed in section . . The potential for Environmental Justice impacts is discussed in section . .

Potentially significant issues described in this section focus on the continuation of ongoing activities at PMRF (No-action Alternative) and the incremental effect of implementing the Proposed Action to the No-action Alternative. Incremental effects are defined as additional levels of existing environmental effects, new environmental effects, or a geographic expansion of existing environmental effects.

The environmental consequences assessment in the~~D~~EIS includes estimates of the potential direct, indirect, cumulative, and unavoidable effects long- and short-term effects and irreversible and irretrievable resource commitments.

Environmental effects are categorized according to the following criteria:

- **No Impact** No impact is predicted.
- **No Adverse Impact** An impact is predicted, but the impact, as mitigated, does not meet the intensity or context criteria needed to trigger a regulatory requirement or impact the quality of the human or natural environment.
- **Adverse Impact** An impact is predicted that meets the intensity or context criteria necessary to trigger a regulatory requirement or impact the quality of the human or natural environment.
- **Beneficial Impact** An impact is predicted to have a beneficial effect on the quality of the human or natural environment.

Intensity here refers to the severity of impact. Context here means that the significance of an action must be analyzed in several contexts, such as society as a whole, the affected region, the affected interests, and the locality.

Mitigation measures consist of general descriptions of the steps required to mitigate the adverse impacts of the No-action Alternative and Proposed Action. The EIS will identify measures already committed to as part of current, ongoing activities, and those additional mitigations (if any) which could reasonably be expected to reduce impacts if the Proposed Action is implemented.

Although Tern Island and Johnston Atoll were originally site alternatives in the Draft EIS, the Navy has determined that they are not reasonable alternatives and therefore have been eliminated as proposed sites in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Tern Island and Johnston Atoll have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island and Johnston Atoll are no longer reasonable alternatives takes precedence over these other discussions concerning Tern Island and Johnston Atoll in this EIS.

4.1 PACIFIC MISSILE RANGE FACILITY

4.1.1 PMRF/MAIN BASE

Potentially significant issues for each resource area are identified in the following sections.

4.1.1.1 Air Quality— PMRF/Main Base

The air quality analysis consists of:

- Comparing the air quality at the various sites to Federal and State ambient air quality standards. This includes potential effects of intermittent sources such as rocket motor exhaust and agricultural burning.
- Comparing the air quality at the various sites to health-based guidance levels for those toxic emissions not specifically regulated on a State or national level. This includes hazardous air pollutants not covered under the ambient air quality standards. Potential hazardous air pollutant sources include, but are not necessarily limited to, rocket motor exhaust, unspent missile fuel vapors, generator exhaust, and various solvent and cleanser vapors. As with the criteria pollutants above, intermittent sources are considered.

4.1.1.1.1 No-action Alternative— Air Quality, PMRF/Main Base

Several current activities on PMRF/Main Base generate pollutant emissions. These activities include launching drones, missiles, and exercise rockets extensive use of flares during exercises aircraft emissions emergency generator usage standard power generation base maintenance operations (painting, woodworking, and vehicle maintenance) and support activities at the torpedo post-run facilities, refueling trucks, fuel farm, fire prevention training sites, and gas station.

Land-based Training and Operations

In terms of air permitting requirements, PMRF/Main Base is considered a ma or source of air pollutants, since it has the potential to emit more than , 2 kilograms (1 tons) per year of one or more criteria pollutants (CFR .2/.3). As such, the State of Hawaii issued a Title V Covered Source Permit (No. 11 - 1-C) for the five diesel generators at

PMRF/Main Base on 28 January 1 8. ~~a permit to operate is being finalized which restricts the amount of pollutants the base is allowed to emit. The permit is known as a Title V permit.~~ The ~~Title V~~ permit covers ~~emissions for~~ all significant stationary air pollution emission sources on PMRF/Main Base and limits the amount of pollutants the sources can emit. It does not consider any of the outlying areas on Kauai. ~~The significant stationary pollutant emission sources on PMRF/Main Base are the power generators.~~ The Title V permit controls the emissions generated by restricting the hours of use for each generator. Some sources of emissions generate pollutants at such low levels that they are considered insignificant when compared to the power generators. These sources include: emergency generator usage, base maintenance activities, and target support operations. It is important to note that missiles, drones, rockets, aircraft, helicopters, and ground traffic are all considered mobile sources. As such, their emissions are not restricted by the Title V permit. Restrictions imposed by the title V permit are designed to maintain air quality within the NAAQS. Operations are currently within the Title V permit s restrictions. Therefore, it is assumed current operations do not cause exceedances of the NAAQS and do not cause exposure to hazardous concentrations of HAPs.

Along with agricultural burning, rocket motor exhaust is the most visible source of local air pollution emissions. Missile and rocket launches are characterized by intense combustive reactions over a short period of time, which results in exhaust streams of varying sizes, depending upon the size of the launch vehicle. Table .1.1.1-1 lists ma or exhaust components from typical missiles launched from PMRF.

Table 4.1.1.1-1: Exhaust Products of Typical Missiles Launched from PMRF (in kilograms [pounds] per launch)

Missile	Al_2O_3	CO	CO_2	H_2	H_2O	HCl	N_2	Pb	Others
Castor IV	2, (,3 .)	2, (, 2 .3)	3 8 (.)	22 (8.2)	8 (1, 3 .)	2, (, 2 .)	8 (1, .)		3 (.)
Hawk	8 (1 .8)	(1 3.3)	3 (.)	(8.8)	2 (2.)	(132.8)	3 (.)		(8.8)
Malemute	1 (3 8.2)	12 (2 .)	1 (33.1)	12 (2 .)	3 (.2)	1 8 (238.1)	2 (2.)		1 (2.2)
STARS[2]	,1 (11,2 .)	3, (8,3 8.)	3 1 (8 2.)	288 (3 .)	8 (1, 18.)	1, 2 (3,88 .)	1, 83 (3, 1 .3)		2 (2.)
STR PI	1,3 2 (2,8 .)	1,3 (3, 18.1)	1 (3 1.)	1 3 (22 .1)	312 (8 .8)	(1, 31.)	2 (.)		
Terrier		228 (2.)	1 (3 2.)	1 (22.)	(11 .)		3 (1 .)	1 (22.)	
Vandal[1]		2 (1, 18.)	(1, .3)	22 (8.)	13 (3 .)		1 8 (3 .)	22 (8.)	

[1] Source: U.S. Department of Energy, 1 2 White Sands Missile Range, 23 Dec 1 2 U.S. Army Space and Strategic Defense Command, Jan 1 . 152
Exhaust products are for boosters only. 181
[2] Exhaust products are for totals for all three stages.

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A nominal rocket launch consists of motor ignition followed by a constant acceleration upward and down-range, resulting in the highest volume of exhaust to be at or near ground level.

As noted in chapter 3, the air in any one geographical location is a relatively homogenous blend. This generalization holds most true for the troposphere (out to approximately 1 km .3 mi from the Earth s surface). However, this level of homogeneity is measured in terms of hours. The initial vigorous mixing takes place at an even lower, more restricted altitude, up to a variable altitude referred to as the mixing height. The mixing height is variable due to changing seasons, sunlight, weather patterns, wind speed and direction, and local topographic effects. For the Hawaiian Islands, the average annual mixing height is approximately 1, m (3, ft).

The rocket motor s exhaust would be emitted as a cloud at an extremely high temperature. This high temperature causes the cloud to rise, while local winds tend to move it along laterally. As the cloud cools, it stops rising, and the mechanical aspects of dispersion predominate. The altitude at which this occurs, referred to as the stabilization height, may vary greatly from one missile type to another based upon exhaust products, exhaust rate, and exhaust temperature. Additionally, stabilization height would vary from launch to launch due to changes in meteorological conditions.

Only the portion of the motor s exhaust that stabilizes below the mixing height has an impact on air concentrations that might affect areas to which the public has access. Any exhaust that stabilizes above the mixing height would take an extended time to reach the surface.

In the event of a temperature inversion, the mixing mechanics are limited even more. If the inversion were to occur below the stabilization height, there would be virtually no local impact from exhaust products because nearly all the exhaust products would be excluded by the inversion. However, if the inversion were to occur slightly above the stabilization height, this same effect would contain the exhaust products to the local area, resulting in the highest short-term impacts due to missile launch activities.

Missile launch activities at PMRF/Main Base can be categorized by the ground hazard areas associated with the launch. There are three primary ground hazard areas: 1 m (2, ft), 1,82 m (, ft), and 3, 8 m (1 , ft).

The smaller SMOKE SAMs are the exception and use a much smaller ground hazard area (m 2, ft). These unguided munitions are used specifically to generate a visible exhaust trail to accustom pilots to the concept of ground fire. Approximately SMOKE SAMs were fired in 1 . In addition, pencil flares are used extensively along with SMOKE SAMs during exercises. No air quality impacts are anticipated, and only moderate short-term visibility impacts are pro ected due to continued use of SMOKE SAMs.

The air quality analysis uses a single missile or launch vehicle type from each ground hazard area classification to represent the potential for impacts due to launches from that ground hazard area. In order to present a conservative analysis, each missile or launch vehicle selected represents the greatest emissions for a rocket motor in that ground hazard area launch category.

The 1 -m (2, -ft) ground hazard area is limited to usefor launching~~as a launch area for~~ drones and smaller missiles such as the Hawk. The drones all use et engines to maintain flight speed. Ground launching requires the additional use of one or two strap-on rocket-assisted take-off (RATO) boosters to accelerate the drone to cruising speed. The RATO used by drones emits less air pollutants than the Hawk missile. As such, the Hawk is the missile used to represent emissions within the 1 -m (2, -ft) ground hazard area. Following USEPA guidance as presented in CFR 1 Appendix W, the air quality analysis of potential impacts due to the missile launches used initial screening to establish whether the Proposed Action has the potential to cause anexceedance of the NAAQS (or health-based guidance levels for those pollutants not addressed in the NAAQS) in areas to which the general public would have access. The guidance indicates that additional refined analysis must be conducted in instances where the screening indicates potential forexceedances.

The screening was conducted using the USEPA-approved TSCREEN PUFF model. This model is specifically designed to provide conservative results based onthe amount of pollutant emitted and elevations at which it would be emitted. Since this screening analysis indicates there is no potential for exceedances ~~for~~ of the NAAQS or health-based guidance levels beyond the ground hazard area, no further analysiswas~~is~~ conducted for the Hawk launch or mishap scenarios. Screening, using the TSCREEN/PUFF model, indicates there is no potential for exceedances of either the NAAQS or health-based guidance levels due to emissions up to and including complete combustion of the Hawk motor on the pad. Therefore, no impacts to air quality are anticipated due to launches of missiles which use the 1 -m (2, -ft) ground hazard area. Table .1.1.1-2 summarizes the TSCREEN/PUFF results.

Table 4.1.1.1-2: Summary of TSCREEN/PUFF Results for Hawk with Complete Combustion

Pollutant	Guidance Level	Mass Emitted in kilograms (pounds)	Maximum Concentration (mg/m^3) at 1-hour TWA	Distance to Maximum Concentration in kilometers
Aluminum Oxide	mg/m^3	8 (11)	.	1. 3
Carbon Monoxide	mg/m^3	(1)	.	1. 3
Hydrogen Chloride	1. mg/m^3	(13)	. 8	1. 3

The 1,82 -m (, -ft) ground hazard area is used for Vandal launches. The Vandal launch motor is the Talos. The sustainer is a ram et engine. The EST Flight Test Experiments EA analyzed the potential air quality impacts for both nominal launches and mishaps of a missile system which used the Talos motor. This analysis included computer screening using the PUFF model. For nominal launch conditions, this analysis indicated no potential for exceeding applicable short-term guideline concentrations. Due to the altitude at which it operates and the mobile nature of the emitter (the Vandal), the ram et is not expected to impact ambient air quality. No air quality impacts are anticipated due to the continued use of this ground hazard area to launch Vandals. Additional screening using the TSCREEN PUFF model indicates there would also be no potential forexceedance of either the NAAQS or health-based guidance levels in the event of a near-launch pad mishap which involved the combustion of the entire launch motor.

The modified 3, 8-m (1 , -ft) ground hazard area is currently used to support the Strategic Target System launch program. The Strategic Target System Environmental Monitoring Program report for the 2 February 1 3 launch of the Strategic Target System from PMRF analyzed pre- and post-launch air quality and confirmed there are no exceedances of guidance levels at any public exposure location. There are short-term exceedances within the ground hazard area. However, the ground hazard area is evacuated prior to launch. Therefore, no air quality impacts are anticipated due to continued use of the modified 3, 8-m (1 , -ft) ground hazard area at its current pro ected level.

Pencil flares are used extensively during operational exercises. These occurrences are short-lived and occur intermittently throughout the year. No air quality impacts are anticipated from their continued use.

4.1.1.1.1.1 Base Operations and Maintenance

Power generators for PMRF/Main Base would be operated ~~under~~ in compliance with the PMRF Title V Covered Source Permit. Therefore, no adverse impacts to air quality are anticipated for the continued use of these generators. In addition, emergency generators are run intermittently on PMRF/Main Base in order to maintain their readiness against actual need. Hawaii air pollution regulations make specific exemption allowances for emergency generators. No air quality impacts are anticipated from the continued usage of the generators as currently defined.

The possibility exists for cumulative impacts to air quality from both land-based training and operations and base operations and maintenance when current operational levels are examined along with other emissions in the local area. When agricultural burning, unrelated to PMRF, is in progress, the potential exists for a temporary cumulative effect on air quality. Agricultural burning, which is conducted under permit, emits large quantities of particulates, which may add to, or cause exceedances of, National or State AAQS.

No mitigation measures for air quality are proposed for the No-action Alternative.

4.1.1.1.2 Proposed Action— Air Quality, PMRF/Main Base

The Proposed Action includes launching a wider variety of missiles from PMRF/Main Base and KTF. These missiles would use ground hazard areas comparable to those already established for current launch programs. No adverse impact is anticipated due to launches of current missiles. No missile proposed for launch would emit greater exhaust components than those used for the analysis of air quality impacts for the three primary ground hazard area distances. As such, no adverse impact is anticipated for the normal launch activities. Table .1.1.1-3 lists exhaust components of typical Proposed Action ground-launched missile systems. Table .1.1.1- summarizes the anticipated maximum pollutant concentrations associated with the three ground hazard areas.

The Proposed Action also includes provisions for additional storage and launch of liquid-fueled missiles. Liquid-fueled missiles typically use a fuel (such as hydrazine), kerosene, and a / mix of triethylamine and dimethylaniline, which will spontaneously combust in the presence of a strong oxidizer (such as nitric acid or NTO). The exhaust components of this type of missile generally have less impact on air quality than those of equivalent sized solid-fueled missiles. However, as indicated in Appendix J s table J-2, both the fuel and the oxidizer present potential inhalation hazards if exposed to the ambient air. Potential hazards are addressed in section .1.1. .

Table 4.1.1.1-3: Exhaust Products of Typical Proposed Action Ground-launch Missiles (in kilograms [pounds])

Missile	Al_2O_3	CO	CO_2	H_2	H_2O	HCl	N_2	Pb	Others
PAC-2	18 (.)	1 8 (32 .3)	 (1 .)	12 (2 .)	13 (2 .)	1 (18.)	 (1 3.1)		3 (.)
PAC-3/ MEADS	1 (.)	2 (.3)	3 (.)	3 (.)	8 (1 .)	2 (2.)	1 (22.)		
THAAD	1 2 (313.1)	 (211.)	8 (1 .)	1 (22.)	2 (.1)	83 (183.)	32 (.)		
Hera[1]	1, 3 (88,3 .)	1,32 (2, 18.)	28 (32.)	11 (2 .)	 (1, .)	1,3 (3, 8 .2)	 (1,1 .2)		 (1 3.1)
Lance	 ( )	2 ( )	211 ( )	1 (1)	2 3 (8)	1 (1)	1 1 (2)	2 ( )	18 (3)
Liquid-Fueled		82 (2,1)	22 (2, 3)	38 (83)	1 (2,11)		 (1, 8)		 (2)

[1]Stage-1 only
Source: Fax from R.S. Hiers III of Advanced Missile Signature Center, Arnold AFB, TN, 1 Dec U.S. Department of Energy, July 1 2 U.S. Army Corps of Engineers, 3 January 1 2 U.S. Army Space and Strategic Defense Command, January 1 U.S. Army Space and Strategic Defense Command, March 1 Department of the Army, June 1 U.S. Army Space and Strategic Defense Command 2 September 1 . 33, 152 132, 133 218

Table 4.1.1.1-4: Exhaust Products of Typical Proposed Action Ground-launch Missiles (in kilograms [pounds])

Pollutant	Guidance Level	Pollutant Concentration (in milligrams per cubic meter)		
		1 m (2 ft) GHA (Hawk)[1]	182 m (, ft) GHA (Talos/ est)[2]	3 8 m (1 , ft) GHA (Strategic Target System)[3]
Aluminum Oxide	1 (8-hour Threshold Limit Value TLV Time-weighted Average TWA)	--	--	8. 1 m (23 ft)
	(8-hour TWA)	. 1 m (2 ft)	. 3 m (8 ft)	--
Carbon Monoxide	(1-hour TWA)	. 1 m (2 ft)	--	. 2 3 m (8 ft) . 8 3 m (8 ft)
	1 (8-hour TWA)	--	. 3 m (8 ft)	
Hydrogen Chloride	1. (1-hour TWA)	. 8 1 m (2 ft)	. 1 3 m (8 ft)	. 3 m (8 ft)

Source: U.S. Army Strategic Defense Command, 1 2, Feb, p. - through -1 Strategic Defense Initiative Organization, 1 1, Jul, p.3-12 through 3-18. 139, 114
[1]Hawk emissions are based on screening using the EPA-approved TSCREEN/PUFF model
[2]Talos emissions were derived using the commercial version of the TSCREEN/PUFF model (Department of Defense, 1 1, pages 3-12 3-18) 114
[3]Strategic Target System analysis used the Rocket Exhaust Effluent Dispersion Model (REEDM) to model Hydrogen Chloride levels. (U.S. Army Strategic Defense Command, 1 2, pages - -1)
U.S. Army, Strategic Defense Command. 1 2, page -1 139, 139
Value is a 1-hour TWA. Due to near-instantaneous nature of emissions, 8-hour TWA would be lower.

Termination of target booster flight shortly after liftoff would result in potentially hazardous debris being contained within the ground hazard area or launch hazard area, where the public and non-essential personnel would be excluded. Personnel within the ground hazard area would be protected in bunkers or behindberms. During operations, personnel remaining outdoors within the launch hazard area, downwind of the launch, would wear appropriate safety equipment (e.g., respirator masks). Air emissions from the flight termination could pose a health threat however, modeling conducted for the largest solid propellant target boosters for the 1 -m (2, -ft), 1,82 -m (, -ft), or the modified 3, 8-m (1 , -ft) ground hazard area determined that all exhaust concentrations were below applicable health-based standards at each of the respective ground hazard area boundaries.

In addition to the increased variety of missiles and launch vehicles proposed for use at PMRF, selection of the Proposed Action would result in an increase in the number of launches per year. However, each launch is a discrete event. The logistics of the launch procedures would allow sufficient time between launches so that no exhaust from one launch would impact the ambient air quality during the next. In the event of dual launches of target missiles, the exhaust products would nominally be double those for a single launch, assuming the two target missiles are the same. However, because the launch pads or rails would be apart from each other, the amount of exhaust product deposition on any given spot on the ground would be less than the combined exhaust product. Each launch event is discrete from a separate location therefore the individual launches air quality effects are not additive. As such, overall impacts to air quality are anticipated to be equivalent to those of any one launch. Therefore, no adverse impacts to air quality are anticipated.

Cumulative impacts to air quality from the Proposed Action would be anticipated to be similar to those described for the No-action Alternative. Specifically, agricultural burning, unrelated to PMRF, causes elevated amounts of particulates and when added to the particulate level from the MCD-US and HLB programs could lead to anexceedance of the established NAAQS. Any exceedance of NAAQS would be of very short duration, since the Navy programs are isolated, short-term events.

No mitigation measures for air quality are proposed.

4.1.1.2 Airspace— PMRF/Main Base

4.1.1.2.1 No-action Alternative— Airspace, PMRF/Main Base

4.1.1.2.1.1 Land-Based Training and Operations

Controlled and Uncontrolled Airspace

Ongoing activities at PMRF/Main Base would continue to utilize the existingoverwater special use airspace. No new special use airspace proposal, or any modification to the existing special use airspace, is contemplated to accommodate continuing mission activities. Consequently, no reduction in the amount of controlled and uncontrolled airspace in the region of influence would result, and thus no impacts to the controlled and uncontrolled airspace in the region of influence would result from the No-action Alternative.

Special Use Airspace

The ongoing activities would continue to utilize the existing special use airspace. Although the nature and intensity of utilization varies over time and by individual special use airspace area, the continuing mission activities represent precisely the kinds of activities for which the overwater special use airspace was created. Restricted Areas were designated to contain hazards to non-participating aircraft, and Warning Areas were set aside to accommodate activities that present a hazard to other aircraft. Warning Areas consist of airspace over international waters in which hazardous activity may be conducted. This designation corresponds to the Danger Area designation of ICAO. As such, the continuing mission activities do not represent an adverse impact to special use airspace and do not conflict with any airspace use plans, policies, and controls.

En Route Airways Jet Routes

In terms of potential airspace use impacts to the region of influence s two en route airways and et routes, the continuing mission activities would be in compliance with DOD Directive .1, which specifies procedures for conducting aircraft operations and for missile and pro ectile firing namely, the missile or pro ectile firing areas shall be selected so that tra ectories are clear of established oceanic air routes or areas of known surface or air activity. In addition, before conducting an operation that is hazardous to non-participating aircraft, NOTAMs would be sent in accordance with the conditions of the directive specified in OPNAVINST 3 21.2 A, *Department of Defense Notice to Airmen (NOTAM) System*, dated 1 January 1 . However, when Warning Area W-188 is being used, IFR traffic on the V1 airway in the far southern part of W-188 would be rerouted by Honolulu ARTCC if necessary. To enhance the real-time utilization of the airspace associated with Warning Area W-188, PMRF operates under a Memorandum of Understanding with the Honolulu Combined Center/Radar Approach Control and the Oakland ARTCC so that the use of various W-188 subareas is coordinated with these controlling agencies. Aircraft are either scheduled to cross any impacted portion of W-188 before or after test and training activities are conducted, or are rerouted. Consequently, there are no adverse impacts to the region of influence s en route airways and et routes.

Aircraft using the V1 airway through the northern part of W-18 and over Niihau would not likely be re-routed by air traffic control if they are flying over 2, 2 m (, ft) mean sea level, since W-18 extends up to but does not include 2, 2 m (, ft).

Airports and Airfields

Ongoing ~~continuing~~ activities would continue to use the existing special use airspace and would not restrict access to or affect the use of the existing airfields and airports at PMRF. Operations at the PMRF airfield would continue unhindered.

Similarly, the existing airfield or airport arrival and departure traffic flows would not be affected by the No-action Alternative. Access to the PMRF airfield, Kekaha airstrip, and the heliports at Kokee and Makaha Ridge would not be curtailed. With all arriving and departing aircraft, and all participating military aircraft, under the control of the PMRF

Radar Control Facility, there would be no airfield or airport conflicts in the area under the No-action Alternative.

4.1.1.2.1.2 Base Operations and Maintenance

The meteorological rocket and radiosonde balloon launches which originate within Restricted Area R-31 1 will impact in the W-188 Warning Area, which has an effective altitude from the surface to unlimited. They may continue rising within Warning Area W-188, which also has an effective altitude from the surface to unlimited. Consequently, there would be no impact to controlled and uncontrolled airspace, special use airspace, en route airways and et routes, and airports and airfields in the region of influence.

In terms of the potential for cumulative impacts, all the ongoing, continuing mission airspace use activities would take place in existing special use airspace that has been in existence since the early 1 s, and is determined clear of non-participating aircraft. The required scheduling process for the use of this airspace would obviate the potential for adverse cumulative impacts.

In terms of mitigation measures, the well-defined special use airspace dimensions and scheduled time of use on aeronautical charts, in addition to the positive air traffic control, obviate the need for mitigation measures.

4.1.1.2.2 Proposed Action— Airspace, PMRF/Main Base

4.1.1.2.2.1 Controlled and Uncontrolled Airspace

~~The~~ P~~p~~roposed missile launches from ~~out of~~ KTF would have no impact on the controlled and uncontrolled airspace in the PMRF/Main Base region of influence. Target missiles launched from KTF would be well above Flight Level (FL) (18,288 m , ft) and still be within the R-1 1 Restricted Area, which covers the surface to unlimited altitude, within 1 minute of the rocket motor firing. All other local flight activities would occur at sufficient distance and altitude that the target missile launches would have no effect ~~be little noticed~~.

Implementation of ~~the~~ ALTRV procedures, where the FAA provides separation between non-participating air traffic and the missile s flight path within the Temporary Operations Area under prescribed conditions, would have minimal impact on the region of influence s controlled and uncontrolled airspace. ALTRV procedures would be used as authorized ~~authorization~~ by the Central Altitude Reservation Function, an air traffic service facility, or appropriate ARTCC for airspace utilization. PMRF would coordinate with the Oakland ARTCC military operations specialist assigned to handle such matters, and the airspace coordinator at the Honolulu Center Radar Approach using ALTRV request procedures.

After receiving the proper information on each test flight, a hazard pattern would be constructed and superimposed on a chart depicting the area of operations. Ensuring that the hazard pattern would not encroach on any land mass, this area is then plotted using minimum points (latitude-longitude) to form a rectangular area. This plotted area is then faxed to the military operations specialist at Oakland ARTCC requesting airspace with the following information: area point (latitude-longitude) date and time for primary and backup (month, day, zulu time) and altitude. A copy would be sent to the Honolulu Center Radar Approach. A follow-up phone call would be made after 8 hours to verify receipt of the fax. When approval of the request for the airspace is received from the military operations specialist at Oakland ARTCC, PMRF would submit an ALTRV request to Central Altitude Reservation Function who would publish the ALTRV 2 hours prior to the flight test. Implementation of the stationary ALTRV for airspace utilization would provide for separation between IFR traffic and the missile launches.

4.1.1.2.2.2 Special Use Airspace

Missile launches from KTF would be conducted within the existing Special Use Airspace in Restricted Area R-31 1 and extend into the ad acent W-188 Warning Area controlled by PMRF, and would not represent a direct Special Use Airspace impact. The target missile launches represent precisely the kinds of activities that Special Use Airspace was created for: namely, to accommodate national security and necessary military activities, and to confine or segregate activities considered to be hazardous to non-participating aircraft.

4.1.1.2.2.3 En Route Airways and Jet Routes

Two en route low altitude airways, V-1 and V-1 , ~~in the PMRF/Main Base region of influence~~ have the potential to be impacted by the target missile launches out of KTF, (see figure 3.1.1.2-3). For target missiles launched from KTF, they ~~missile~~ would be above FL and still be within the R-31 1 Restricted Area, which covers the surface to unlimited altitude, within 1 minute of the rocket motor firing. All other local flight activities would occur at sufficient distance and altitude that the target missile launches would be little noticed. Moreover, for target missiles launched from KTF, implementation of the ALTRV procedures, described above, would have minimal impact on the two en route low altitude airways. There are no high altitude et routes in the PMRF/Main Base region of influence.

~~However, the P~~Proposed flight tests would also use Warning Area W-188, which is in continuous use from the surface to unlimited altitude. Whenever hazardous activities take place within W-188, Honolulu ARTCC would reroute IFR aircraft using the V-1 low altitude airway that passes through its southern part. However, as discussed under the No-action Alternative, this is done routinely through daily coordination between PMRF and the controlling airspace agencies, resulting in the smooth transition of aircraft through the area with no adverse impact on en route airways or et routes.

4.1.1.2.2.4 Airports and Airfields

The Proposed Action would not restrict access to, or affect the use of, existing airfields and airports in the region of influence. Operations at the PMRF/Main Base airfield would continue unhindered. Similarly, the existing airfield or airport arrival and departure traffic flows would not be affected. Access to the PMRF/Main Base airfield, Kekaha airstrip, and the heliports at Kokee and Makaha Ridge would not be curtailed. With all arriving and departing aircraft, and all participating military aircraft~~,~~ under the control of PMRF Radar Control Facility, there would be no airfield or airport conflicts in the region of influence under the Proposed Action, and thus no impact.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.1.1.3 Biological Resources, PMRF/Main Base

4.1.1.3.1 No-action Alternative— Biological Resources, PMRF Main Base

The biological resources analytical approach involves evaluating the potential impact of the No-action Alternative activities on vegetation and wildlife, including threatened and endangered species. Biological resources could potentially be affected by alteration or loss of vegetation and disturbance of wildlife. Impacts are assessed by comparing pro ect characteristics and activities to known locations of sensitive biological resources. In analyzing both the No-action and Preferred Alternatives, considerable discussion has been dedicated to marine mammals, and potential impacts which may result from various open ocean and amphibious operations. Pioneering research is being performed by the Navy to better understand the effects of noise on bottlenose dolphins and other marine mammals in their habitats. Sufficient information is not available at this time to establish a potential effect to marine mammals from sonar operations. The time required to gather adequate data is extensive as well as cost prohibitive and would not support timely decisions on this issue. Nonetheless, the Navy will continue research of these potential issues and factor information, as it becomes available, into any activities that result from decisions on this action as well as other related Navy operations. As this research matures, more specific future mitigation approaches will be adopted by the Navy, in consultation with NMFS. Potential impacts to open ocean marine resources from fleet training exercises are addressed in section . .

4.1.1.3.1.1 Land-Based Training and Operations

~~**Aerial Target and Missile Launches**~~

Potential impacts of aerial target and missile launches on terrestrial and marine biological resources within the region of influence of PMRF/Main Base activities have been addressed in detail in the Draft EIS for the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p. -22 through -3). That analysis concluded that vegetation near the 13
launch pad could have some temporary distress from the heat generated at launch and from hydrogen chloride emissions. However, there was no evidence of any long-term adverse effect on vegetation from two decades of launches at PMRF. Similarly, it was determined that the noise from launches may startle nearby wildlife and marine mammals, and pro ect floodlights could disorient the threatened Newell s shearwater. However, the use of shielded lighting would mitigate impacts to the Newell s shearwater, and effects on other wildlife were not expected to be adverse, due to the infrequency and short duration of launch events. Based on the analyses done at that time and the effects of past target and missile launch activities, the potential impacts of these activities on biological resources are expected to be minimal and not adverse.

Surface impacts of drones and ordnance are expected to occur in offshore locations. The potential for an ob ect or ob ects dropping from the air to affect marine mammals or other marine biological resources is less than 1 - (1 in a million) (U.S. Army Strategic Defense 13

Command, 1 2, Feb, p. -2). Unrecovered drones, towed targets, and ordnance would sink to the ocean floor. 13

Following inert mining exercises, MINE and SLMME mines are recovered so that there is no residual effect of the exercise on biological resources. In the SLMME mine deployment, there is a potential for an off-line mobile mine to collide with the underwater reef that is used to simulate the harbor.

There is a potential for adverse effects on any green sea turtles that may bask or nest on the sandy beaches at Ma ors Bay from: amphibious landings in the littoral (intertidal) zone and onto the beach, use of tracked and wheeled vehicles, several hundred troops, hovercraft, and the use of spotting lasers. The use of landing craft and transport vehicles to move materials across the beach at Ma ors Bay was addressed in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p. -28), and the impacts were found to be low due to the low likelihood of sea turtle nests being present on the beach and avoidance of any nests found. The land-based training exercises differ in magnitude of action, but because of the continuing daily disturbance of the beach habitat by recreationists and the implementation of mitigation measures (as noted below), the resultant impacts to sea turtles are expected to be minimal and not adverse. 13

Since there has been an active ongoing program to discourage the Laysan albatross from nesting on PMRF, bird strikes by landing and low-flying aircraft have not been a problem. Therefore, bird strikes by aircraft are expected to be a negligible impact and not significant.

No impacts are expected to birds or other wildlife on PMRF/Main Base due to operation of sensors, including radar, and other communications transmitters. Surveys of affected beach areas of turtle nesting prior to amphibious landings could minimize any potential adverse effects.

4.1.1.3.1.2 Base Operations and Maintenance

~~Potential noise impacts from air operations on wildlife, including birds, were addressed in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p. -2). The noise related to missile and target launches was found to have negligible impacts on biological resources.~~ Noise generated by ~~other~~ ongoing operations and maintenance would be less than the launch of a Strategic Target System or a STR PI target system discussed in section .1.1.3.1.1, and ~~, which are infrequent and, therefore,~~ would be expected to have no or negligible effects on wildlife within the region of influence. There is no evidence that low flying aircraft affect the birds or other wildlife resident within the PMRF/Main Base region of influence.

Lighted areas could affect the movement of the threatened Newell s shearwater. Lights can confuse the young birds when they travel from nest sites to the sea, causing them to collide with poles, antennas, and other facilities.

Ongoing recreational activities would have little to no effect on the littoral or rocky intertidal zone along the coastal areas of PMRF. Most of the recreational activity in these areas is limited to fishing. Little impact is expected from recreational activities in the reef areas along the coastline of PMRF because the area is not favorable for scuba diving due to rough surge and wave conditions. In other reef areas to the north of PMRF, scuba diving activities are not expected to affect the biological resources if existing State and Federal regulations are followed.

Recreational access to sandy beach areas is required by State law. Sandy beaches such as Ma ors Bay can be accessed by driving off-highway vehicles onto PMRF-controlled beaches from the south. The sand dune areas to the north are accessible on a continuing basis from the Polihale State Park to the north. No incremental increase in impacts is expected to occurover the existing conditions within those areas under the urisdiction of PMRF as a result of the No-action Alternative. Impacts on the sand dunes and sandy beaches, including the potential green sea turtle use areas, are expected to be negligible.

The potential effects of littering of beaches by recreationists and the potential effects of the use of beach fires on biological resources were considered. At the current levels and with the implementation of mitigation measures, impacts are expected to be negligible.

The training area ust north of the Nohili Ditch supports ruderal herbaceous plants with kiawe/koa hoale scrub present in some areas. Ongoing activities conducted by the HIANG have not demonstrated significant impacts on biological resources. No impact is expected due to the continuation of these activities.

~~The potential impacts of the ongoing launch activities at KTF are discussed in more detail in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p.2-1 through -). With implementation of the mitigations outlined in the environmental documentation~~, I~~i~~mpacts on biological resources from continuing missile launch activities are expected to be negligible and not significant with implementation of the mitigations outlined below. (U.S. Army Strategic Defense Command, 1 2, Feb, p. -2 and -3) 13

The continuing presence of a formerly sensitive plant species after many years of launch activity suggests that emissions from Strategic Target System launches will not have any significant impact on adder s tongue (*Ophioglossum concinnum*) and other rare species. In fact, the adder s tongue has subsequently been removed from the list of candidate species. Impacts from construction can be mitigated by relocating plants to protected locations.

The Newell s shearwater (*Puffinus newelli*) is a federally listed threatened species that may fly over PMRF at night, mainly between April and November. Reflection from outdoor lighting could disorient the birds. New lighting will be designed to minimize reflection.

The likelihood that debris from a spent booster or terminated launch would strike a humpback whale (*Megaptera novaeangliae*) or any other marine mammals is remote. If whales or monk seals (*Monachus schauinslandi*) are sighted in the safety zone or launch hazard area, the launch will be delayed until they are clear. Liquid propellant transport activities by landing craft will avoid any interference with green sea turtle (*Chelonia mydas*) nests that may be located on the beach. (U.S. Army Strategic Defense Command, 1 2, p. ES-) 13

To protect threatened and endangered wildlife species, several specific procedures will be implemented. Any outdoor lighting associated with construction activities and permanent structures will be properly shielded, following USFWS guidelines, so as not to attract

Newell s shearwaters (*Puffinus newelli*), which may traverse PMRF. Prior to any launch, the U.S. Navy will survey the restricted waters of the water safety zone, and if non-participants are present the launch will be delayed. This is a standard safety procedure at PMRF. If any monk~~s~~ seals are observed during safety clearance activities, the launch would be delayed until the seals have cleared the area. The beach areas where the transport vehicles may be used will be surveyed by a trained observer during the appropriate season for sea turtle nests. Any observed nests will be noted and avoided during transport.

Additional measures could further reduce possible environmental impacts. The installation of a portable blast deflector on the launch pad could protect the vegetation~~of~~ the ad acent sand dunes. The potential for starting a fire would be further reduced by clearing dry vegetation from around the launch pad. Spraying the vegetation ad acent to the launch pad with water ust before launch would reduce the risk of ignition. Emergency fire crews would be available during ~~all Strategic Target system~~ launches to quickly extinguish any fire and minimize its effects. An open (spray) nozzle will be used, when possible, rather than a directed stream when extinguishing fires, to avoid erosion damage to the sand dunes and to prevent possible destruction of cultural resources. (U.S. Army Strategic Defense Command, 1 2, p.2-32) 13

4.1.1.3.1.3 Offshore Operations

Fishes with swim bladders can detect or react to acoustic emissions, but the impact of these emissions on these fishes is unknown. Studies on the potential impacts of U.S. Navy activities to marine species are underway. In particular, acoustic emissions from various systems and activities could affect marine mammal hearing. Most large mysticete whales are presumed to hear best in the lower frequencies (1 - 2, Hz) where they emit sounds, while the smaller toothed (odontocete) whales and dolphins hear and emit at the higher frequency ranges (1 - 1 kHz). The NMFS has the regulatory authority necessary to ensure compliance with the Marine Mammal Protection Act. NMFS has indicated that Temporary Threshold Shift (TTS), a temporary reversible decrease in hearing sensitivity resulting from exposure to loud sound, is a potential measure for evaluation of the impacts of noise on marine mammals.

Although~~There is little existing~~ scientific literature exists about TTS and marine mammals, there is little scientific certainty on exact levels for TTS. The Office of Naval Research (ONR) is currently sponsoring work to measure threshold shifts in representative seals and sea lions, dolphins, and small whales, but data has not completed peer review. New techniques for examining hearing sensitivities of both small and large whales, including Acoustic Evoked Potentials, Envelope Following Responses, andOtoacoustic Emissions, are currently under examination. Hearing tests of dolphins and small whales (e.g. Au,Nachtigall and Pawloski, 1) indicate that most toothed whales will probably not be affected by low frequency sounds less than 1 dB and below 1 kHz, but sounds between 1 kHz and 1 kHz will be of particular concern. Larger baleen andmysticete whales are likely sensitive to lower frequencies based on the sounds that they produce. No~~firm~~ data are yet available for actual hearing measurements of the large whales, but the above mentioned new techniques, if proven reliable, will be applied to opportunistically test the hearing of these whales in the future.

Current information on the effects sound on marine mammals is incomplete, but that information is relevant to reasonably evaluating foreseeable significant adverse impacts. The Navy desires to address this issue and has undertaken a systematic study to examine the effects of acoustic emissions on marine mammals. One recent study by Ridgway and his colleagues at the Space and Naval Warfare Systems Center (SPAWARS SCEN) in San Diego has been developing a technique to examine TTS in trained Navy dolphins. This study is a pioneering effort in the examination of TTS. TTS is dependent on the duration of the signal and repeated exposures. Thus far, emissions of only 1 second duration have been used. The data were also found to be highly dependent on the incidence angle and would most likely vary with amplitude of the signal, duration of the signal, frequency of the signal, and time between exposures. Data from this study are breaking new ground, but were limited to the bottlenose dolphin.

Additional ONR-funded work is examining TTS on California sea lions, elephant seals, and harbor seals performing more complete work on the bottlenose dolphin and developing new procedures for testing marine mammal hearing. The Navy is also developing long-term research plans that will stress the quantification of exposure of additional species to acoustic emissions with differing experimental approaches and detailed observations of effects. Preliminary studies are also currently being conducted to assess potential impacts of low-frequency sonar operations on marine mammals in the wild.

Once these studies are completed, the Navy, in consultation with NMFS, will incorporate the results in relevant future NEPA analyses and documents as well as consider the potential for effects on ongoing activities. In the meantime, relevant scientific information remains sparse. A large degree of uncertainty exists about the effects of loud sounds on marine mammals. Precise and meaningful conclusions are not currently available for inclusion in this document.

The following discussions rely heavily on the 1 *Report on Military Activities in Hawaiian Waters* (U.S. Department of the Navy, 1), which describes both the individual Fleet Training 1
Exercises and the potential for impacts to humpback whales.

In addition to the specific mitigation measures discussed above, a number of general mitigation measures help ensure that the risk of a harmful effect on marine mammals and humpback whales is extremely low. Since 1 , the Shipboard Environmental Coordinator s Guide to Environmental Compliance informs ships of the NMFS restrictions on approaching humpback whales. Also, all Navy ships calling on Hawaiian ports are advised of key natural resource issues, including precautions regarding whales, in the reply to their request for a berth. Because this anticipates the actual date of arrival by approximately 2 days, the ships are advised of humpback precautions well before they approach Hawaii. This ensures that protection of the humpback whale is officially considered during the planning and conducting of operations, including amphibious warfare operations. In addition, there is an annual ship, submarine, and aircraft notice in mid-November announcing the arrival of the whales, and reminding them of existing restrictions regarding the humpback whales.

4.1.1.3.1.4 Submarine-launched Mobile Mines Exercise

This exercise could potentially impact the coral reefs, described in section 3.1.1.3.2.3, in the exercise area used off the west coast of Kauai. Lost or otherwise nonretrievable torpedoes, debris from shore-based missile launch programs, and other lost or discarded equipment are not expected to produce any measurable impacts on benthic resources beyond that currently experienced during natural conditions associated with storms originating in the North or South Pacific. Within the exercise area, a lost torpedo could conceivably damage or destroy small coral heads or encrusting corals upon impact with the bottom, or by rolling and crushing benthic communities. However, this impact is not considered significant. A ~~similar episode on the reef could result in minor coral damage, though the topography of the reef is such that any such ob ects~~ lost torpedo would be quickly immobilized within or between the numerous channels, cracks, and boulders that dominate the reef. Prior to the signing of EO 13 8 , *Coral Reef Protection*, on 11 June 1 8, marine biological surveys were performed on a portion of the submerged barrier reef. ~~Marine biological surveys~~ These surveys, conducted in October 1 , did not reveal any indication of impact areas or zones demonstrating environmental impacts to benthic communities that could be attributed to past or present submarine-launched mobile mines exercises (EDAW, 1 , 2 Nov, p.1). 22

Lost torpedoes or other underwater test apparatus deposited within the exercise area could enhance biodiversity by providing a solid surface for coral and algae attachment ~~and growth~~, because such ob ects may be large enough to rest well above the zone of sand scour. Coral reefs and limu beds also thrive in areas without lost test apparatus. All operations will be in compliance with the Navy policy for EO 13 8 .

Amphibious Warfare Operations

Amphibious warfare operations necessarily include operations involving submarines, surface forces, and air support. The potential effects of special operations involving swimmers and small boats, whether delivered by surface ships or submarine, are covered separately below, as is the insertion of special forces or U.S. Marine Corps Reconnaissance units from helicopters. Amphibious operations also include extensive low level helicopter flights, which are also covered separately below, along with the potential impacts of landings, takeoffs, and training flights at altitudes above 1 .2 m (ft) by helicopters from ships. This discussion focuses on the potential impacts ~~activities~~ of ~~the~~ ships and associated aircraft involved with training to move forces ashore.

PMRF amphibious operations mainly occur during ma or exercises such as RIMPAC. Ship-launched assaults are also conducted at PMRF. Because of local geography, amphibious operations in these waters typically involve movement from ships located outside the 183-m (1 -fathom) isobath to the beach. Thus, the approach phase and the initial launching of landing craft occur near or outside the 183-m (1 -fathom) line, but the transit to the beach enters the 183-m (1 -fathom) contour.

The potential that amphibious operations could have harmful effects on marine mammals is extremely small. Despite having conducted amphibious operations in the Hawaiian Islands for decades, the Navy is unaware of any documented harmful effects on the marine mammal population. In fact, aerial surveys in 1 3 and 1 (Mobley, 1) indicate that the humpback whale sighting~~siting~~ rates have increased significantly. The most serious potential direct effect of amphibious warfare operations on marine mammals is collision of a ship or landing craft and a marine mammal. Depending on the angle of incidence, speed and depth, such a collision could in ure or kill a marine mammal. The potential for such a collision, however, is extremely remote for a number of reasons. First, amphibious ships generally conduct operations at low speeds or at anchor. Given the ability of some marine mammals to attain speeds of 2 knots, marine mammals are usually able to avoid collision. The risk of collision between one of the landing craft and a marine mammal is also very slight. Landing craft shuttle back and forth from ship to shore over a relatively short distance so that the area of concern is fairly limited. Even within the area, landing craft, LCUs, and LARCs are very limited in speed, most with a top speed under knots in water, andLCUs are limited to 11 knots.

Some of the other landing and support craft are faster. Landing Craft Air Cushion (LCACs) are capable of much faster speeds, up to knots, but their hovercraft design minimizes the risk to a marine mammal if a collision occurs because the LCAC actually rides 1.2 m (ft) above the water. LCACs are also highly maneuverable and can avoid marine mammals if sighted. odiacs, Boston Whalers, and similar small boats can travel at high speed, given their planing hulls and small size, and pose little risk to a marine mammal. A close lookout is maintained to avoid whales if they enter the amphibious assault area. The presence of marine mammals would be quickly detected and crews alerted to the hazard. (U.S. Department of the Navy, 1 , p.1) 1

Another potential effect involves disturbing or changing the marine mammal behavior pattern in a way that would harm it. As addressed above, the lack of collisions between Navy ships and marine mammals may be due in part to the marine mammals ability to detect and avoid amphibious operations. Such operations are localized to a fairly small area and involve large numbers of diesel and turbine-powered small craft that are not optimized for noise reduction, ~~which~~ therefore allowing marine mammals to avoid the area. The areas where the operations are conducted have no known special significance to marine mammals and are in use for only short periods. Even if there is an avoidance reaction, it is transitory. Once the operations are complete, marine mammals can reoccupy ~~even~~ the small area occupied by the exercise. Thus, there are no indirect or cumulative effects except for infrequent potential direct displacement.

~~In addition to the specific mitigation measures discussed above, a number of general mitigation measures help ensure that the risk of a harmful effect on marine mammals and humpback whales is extremely low. Since 1 , the Shipboard Environmental Coordinator s Guide to Environmental Compliance informs ships of the NMFS restrictions on approaching humpback whales. Also, all Navy ships calling on Hawaiian ports are advised of key natural resource issues, including precautions regarding whales, in the reply to their request for a berth. Because this anticipates the actual date of arrival by approximately 2 days, the ships are advised of humpback precautions well before they approach Hawaii. This ensures that protection of the humpback whale is officially considered during the planning and conducting of operations, including amphibious warfare operations. In addition, there is an annual ship, submarine, and aircraft notice in mid-November announcing the arrival of the whales, and reminding them of existing restrictions regarding the humpback whales.~~

Special Operations Involving Swimmers and Small Boats

Special operations involving swimmers and small boats within the 183-m (1 -fathom) isobath pose a very low risk of potentially harmful direct, indirect, or cumulative effects on marine mammals. Similar operations have been conducted in Hawaiian waters for many years without any indication that such operations have had any effect on marine mammal populations.

Small boat coxswains and special operations forces are acutely aware of the environment around them and avoid both unidentified ob ects and marine mammals, which pose a more severe hazard to them than they pose to the mammals. Although most operations are at night, special operations forces are specially trained for night operations and the use of night vision devices.

Chief of Naval Operations Instructions, Operational Orders from the Third Fleet Commander, and a handbook from Commander Naval Surface Group Middle Pacific (Hawaii area) reiterate the requirements of the Marine Mammal Protection Act (MMPA) not to harm, harass, or threaten any marine mammal. The handbook goes further and provides guidance that reiterates the prohibitions in CFR 222.31.

For these reasons, the possibility of a collision with a marine mammal is remote. The small boats are highly maneuverable and able to avoid any interaction with marine mammals. To the extent that marine mammals detect special operations craft, the effect would be very minor and transitory.

Insertion or Extraction of Special Forces or U.S. Marine Corps Reconnaissance Troops from Helicopters into the Water

Special forces are used when stealth is crucial. Helicopters are the primary means to transport special forces troops to border locations because they can travel low to escape detection by radar. When involved in coastal or riverine warfare in which the helicopter cannot transport the troops close enough to the ob ective, special forces units will deploy personnel and rafts directly into the water from the helicopter and then proceed to the mission area. Because avoiding detection is critical in such missions, aircrews must be able to deliver the special forces at very low altitudes usually at night. Training to do this is rigorous but essential to survival in combat. Even where special forces parachute into an ob ective area, recovery usually must be by helicopter.

During ma or exercises, like RIMPAC, special forces deployment may occur at PMRF for realistic operations. To practice inserting special forces units, helicopters approach within several hundred yards of the shore at very low altitude. If only troops are to be deployed, the helicopter will hover within 1 to 31 m (to 1 ft) of the water while the troops slide down ropes into the water (this is known as a fast rope insertion). Upon entry into the water, the forces will swim ashore. The helicopter departs the area after its passengers are deployed.

If a raft is to be employed, the helicopter will approach the desired insertion point and either hover within 3 m (1 ft) of the water or ust touch the water, while the raft is pushed out through the back ramp. Once the troops and equipment are clear, the helicopter lifts off and departs the area.

DOD personnel are aware of the requirement to avoid marine mammals during their operations. Transits to insertion points are often close to the shore, near shallow waters. If a marine mammal were present, it would be visible. Helicopters, being highly maneuverable, can avoid overflight of a marine mammal if one is detected.

As part of the standard procedures, aircrew and special forces personnel must clear the area where they are to land. The clearance procedures serve two purposes. First, they must ensure a safe entry into the water. Second, the clearance procedures ensure that the special forces remain undetected at the moment they are most vulnerable while the helicopter is hovering to drop off passengers and equipment. The risk of harm or effect to marine mammals is remote because of the capability to detect a marine mammal in the vicinity of the insertion point.

During night insertions, night vision goggles are routinely used by the flight crew. Marine mammals would still be avoided, when detected. The landing zone is cleared visually and with visual enhancing devices, when available, such as night vision goggles. If a marine mammal is not detected during the transit to the insertion point, the effect of the helicopter s approach would be transitory since it would only momentarily be in the vicinity of the marine mammal. These operations have no indirect effects and no cumulative impacts.

Explosive Ordnance Disposal and Demolition Operations

~~Navy Explosive Ordnance Disposal (~~EOD~~)~~ teams conduct a variety of exercises within the 183-m (1 -fathom) isobath including moving teams to the site of the ordnance by small boat and deploying divers into the water. Once the simulated ordnance is located, EOD teams set off relatively small charges to familiarize personnel with proper procedures and equipment. Although Underwater Demolition Teams (UDT) also use explosives to remove underwater obstacles, such operations occur in Hawaiian waters relatively infrequently.

Although a variety of EOD training occurs in the ocean area, training involving the use of explosives is relatively rare. In one kind of training, a .1-kg (2 -lb) explosive charge is placed on a buoy suspended . m (3 fathoms) above the bottom in approximately 2 . m (ft) of water. A fuse is lit, the divers clear the area, and the charge explodes approximately 3 minutes later. Approximately 2 to 3 such shots occur annually, distributed throughout the year.

Ma or exercises often include phases that include explosive ordnance disposal. For example, RIMPAC 1 included an event involving neutralization of a simulated piece of unexploded ordnance.

EOD operations pose very little risk of harm to marine mammals or turtles. The only training exercises that could pose any risk are the detonation of the .1-kg (2 -lb) explosive packs. The precautions taken to ensure a clear range, the limited amount of explosives, and the infrequency of the operations reduce this risk to an extremely low level. The range itself is in fairly shallow water. Before any explosive operation, the range is carefully screened visually to ensure that no marine mammals or other intruders are present. When the divers enter the water, they also have an opportunity to detect marine mammals and humpback whales visually or audibly (if the whales are vocalizing). The exercise does not proceed if marine mammals are in the vicinity. The delay between initiating the fuse and the detonation of the explosives is only 3 minutes, minimizing the opportunity for marine mammals to enter the area. Given the relatively small size of the charge, the area within which marine mammals would be at risk from the explosive is quite limited. Prior to EOD training exercises, consultation occurs with the NMFS. EOD operations at PMRF have not resulted in any known indirect or cumulative effects.

4.1.1.3.1.5 Submarine Operations Exercises

~~**Submarine Warfare Exercises**~~

Anti-submarine warfare remains one of the key roles for Navy submarine forces, requiring constant crew training and equipment maintenance. Submarines are deployed to counter the submarine threat but also to be available for shipping lane control. This second mission requires them to train and develop tactics against surface threats.

To meet these missions, submarines will operate near the coastline for shallow water training. Shallow water training is necessary because the physics of sound propagation in water are drastically affected by water depth, temperature gradients, and background noise. These changes can not be simulated. In these exercises, the submarine operates to evade detection from other air, surface, or subsurface platforms while attempting to covertly detect and attack simulated opposition surface and subsurface vessels.

The key sensor for submarines is passive sonar. To optimize sonar performance, submarines on occasion use expendable bathythermographs to measure water temperatures at various depths as described for anti-submarine warfare exercises.

Shallow water proficiency training consists of maneuvering the submarine at speeds generally of 1 knots or less. Equipment and humans ~~Watches are posted 2 hours a day~~ are used to continually monitor the submarine s passive acoustic devices~~, both by equipment and humans~~. In addition to the ability to detect the presence of a vessel or marine mammal, equipment onboard records and resolves the specific location of the noise source. All significant contacts are reported immediately to the officer of the deck for appropriate action, such as avoidance.

~~To enhance a submarine s ability to detect a target, some are equipped with an array of hydrophones that may be towed behind the submarine. The towed linear array significantly enhances the detection and resolution capability of the submarine for both vessels and vocalizing marine mammals. Active sonar is rarely, if ever, used.~~ When conducting operations against other submarines, submarines will fire water slugs from their torpedo tubes to simulate the firing of a torpedo at the other submarine, but no actual torpedoes are shot. A water slug sounds like the mechanical transients made during an actual torpedo launch. The submarine opens the outer door of the torpedo tube and forces the water out of the tube with compressed air.

The most serious potential direct effect of subsurface anti-submarine warfare training on marine mammals is collision of a submarine and a marine mammal. Depending on the angle of incidence, speed and depth, such a collision could in ure or kill a marine mammal. The potential for such a collision, however, is extremely remote for a number of reasons. First, a submarine is least likely to be detected by an adversary, and conversely is most likely to passively detect other vessels, at speeds between to 1 knots. Slow speed also allows for more lead time on navigational corrections in shallow waters. Second, one of the keys to collision avoidance with a marine mammal, vessel, or the ocean bottom is detection. Detection of another vessel is the goal of anti-submarine warfare. During anti-submarine warfare training there is a heightened awareness of the need to detect and identify everything within the water column since it may be the opponent. The Navy has conducted submarine operations in and around the Hawaiian Islands for years, and is unaware of any collisions between a Navy submarine and a marine mammal.

A less serious potential involves disturbing or changing the behavior pattern of a marine mammal in a way that would harm it. As addressed above, the lack of collisions between Navy submarines and marine mammals may be due in part to their ability to detect and avoid submarines a reaction that does not harm the marine mammals. Because Navy submarines do not try to approach or follow marine mammals and few submarines (approximately to 12) are at sea, there is little likelihood of any encounter with a marine mammal.

To enhance a submarine s ability to detect a target, some are equipped with an array of hydrophones that may be towed behind the submarine. The towed linear array significantly enhances the detection and resolution capability of the submarine for both vessels and vocalizing marine mammals.

Active sonar is rarely if ever used by submarines in anti-submarine warfare training since it discloses the presence of the sending unit. If used in waters less than 183 meters (1 fathoms), power is greatly reduced to enhance navigational capabilities. The sonar beam can be focused rather than being omni-directional. The area where sound levels exceed other naturally-occurring sounds is relatively small the duration is limited and the speed of the advancing submarine allows for avoidance by a marine mammal.

The activities under the No-action Alternative should have negligible cumulative impact on PMRF/Main Base. Those activities related to operations for training exercises, missile and target launches, and related activities are discrete intermittent activities, and the impacts of the actions do not interact cumulatively. Since most of the biological habitats on PMRF/Main Base support non-native and non-sand dune vegetation, cumulative impacts are expected to be negligible.

Every effort is made to recover drones, as well as other aerial and towed targets. If they are unrecoverable, they are left to sink to the ocean floor. Such materials may provide artificial reef-like structures.

Mitigations outlined in earlier documentation for the KTF and PMRF/Main Base (U.S. Army Strategic Defense Command, 1 2, U.S. Army Space and Strategic Defense Command, 1 3, 13 Sandia National Laboratory, 1 2) which are applicable to operations on or near the 12 , 8 beach, include providing light shields to reduce potential effects on Newell s shearwater and monitoring beaches for presence of green sea turtles and monk seals.

4.1.1.3.2 Proposed Action— Biological Resources, PMRF/Main Base

4.1.1.3.2.1 Construction

Potential impacts on biological resources at PMRF/Main Base would be caused by ground clearance at proposed sites resulting in vegetation removal, habitat loss, and disturbance of wildlife. In addition, construction noise and the activity of increased personnel present could affect some threatened or endangered wildlife species that use the ponds and drains ad acent to the PMRF/Main Base or the drains that cross the base to the ocean. Construction activities in the sand dune area within the base boundary have the potential to impact *Sesbania tomentosa* and *Panicum niihauensis*, two federally listed endangered species, although these species have not been observed in that area of the dunes. Similar impacts on biological resources have been addressed in the Strategic Target System EIS documentation (U.S. Army Strategic Defense Command, 1 2, Feb, p. -22 through -3). The adder s tongue fern, which 13
the Strategic Target System EIS indicated could be affected by construction activities, is no longer a protected species. The Laysan albatross was also discussed as being potentially affected by construction activities. However, since there is an ongoing program to discourage them from nesting on PMRF, under USFWS permit, they will not be affected by construction relating to the Proposed Action. With the implementation of appropriate mitigations, these impacts to biological resources are expected to be negligible.

4.1.1.3.2.2 Range Training and Operations

~~The launching of missiles from PMRF has been addressed in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p.2-1 through 2-).~~ The incremental increase in target and interceptor launch noise as part of the Proposed Action would not increase the magnitude of the impacts over those discussed under the No-action Alternative~~outlined in the earlier documentation~~, because each launch is a discrete event. Some programs may require increased personnel to be present over what had been estimated for the Strategic Target System and other launches evaluated as part of the ongoing activities at PMRF ~~in the earlier documentation~~. However, this increase is expected to be minor and result in negligible impacts to biological resources. No adverse impacts to threatened or endangered species are expected as a result of the expanded activities included in the Proposed Action. Potential impacts to biological resources in the open ocean are addressed in section . .1.2.

4.1.1.3.2.3 Base Operations and Maintenance

The incremental increase in air operations as a result of the Proposed Action is not expected to cause an increase in noise disturbance to sensitive species. Hawaiian stilts use the Mana pond ad acent to the PMRF/Main Base and have not been disturbed by helicopter activity nearby in the past, and are not expected to be affected by helicopters or other low flying aircraft in the future. Historically, the biggest concern has been ~~relative to~~ bird strike kills ~~has been~~ due to the presence of the Laysan albatross. However, with the ongoing efforts by the USDA s Wildlife Services in supporting PMRF in the control of the albatross population on ~~the~~ base, bird strikes from increased operations should be only a negligible impact.

Recreation activities are not expected to increase as a result of the Proposed Action. Therefore, the impact to the littoral (intertidal) area and coral reefs offshore, sand dunes, and sandy beaches should be the same as those evaluated under the No-action Alternative.

The activities proposed as part of the Proposed Action should have negligible cumulative impact on PMRF/Main Base. Those activities related to operations for training exercises, missile and target launches, and related activities are discrete intermittent activities, and the impacts of the actions do not interact in a cumulative manner. Construction activities may have minor cumulative effects, as the numbers and the area covered by existing and new facilities increase, if undisturbed native habitat is affected. Since most of the biological habitats on the PMRF/Main Base support non-native and non-sand dune vegetation, cumulative impacts are expected to be negligible.

In terms of the potential for cumulative EMR impacts to wildlife, the power densities emitted from operating radars are most unlikely to cause any biological effects in animals or birds. The potential for main-beam (airborne) exposure thermal effects to birds exists. Unfortunately, while much information exists on the effects of microwaves on laboratory animals, mostly rats, mice, and similar species, relatively few studies have been conducted on birds. Likewise, while there is specific information on calculating whole-body-averaged specific absorption rates (SARs) at different frequencies for various polarizations for many mammalian species over a wide range of sizes (Durney, et al., 1 8), there is little or no specific information for 213 birds. Mitigating these concerns is the fact that radar beams are relatively narrow. To remain in the beam for any period requires that the bird flies directly along the beam axis, or that a hovering bird such as a raptor does so for a significant time. There is presently insufficient information to make a quantitative estimate of the oint probability of such an occurrence (beam stationary/bird flying directly on-axis or hovering for several minutes), but it is probably low. Thus, although the potential for adverse ~~significant~~ effects on birds exists, the probability that it would occur with any frequency is udged to be low.

Mitigations such as those suggested in the Strategic Target System EIS process and implemented as part of the Strategic Target System EIS program, including use of protective light shields to reduce potential impacts to the Newell sshearwater and surveys of beach areas for turtle nesting prior to amphibious landing, could be implemented as appropriate.

4.1.1.4 Cultural Resources— PMRF/Main Base

Potential impacts on archaeological and historic resources may result from construction, ground-clearing, and off-road traffic activities sound pressure damage increased human presence in archaeologically sensitive areas alteration, modification, renovation, or demolition of existing potentially significant facilities and underwater activities.

Only those cultural resources determined to be potentially significant under existing legislation are sub ect to protection from adverse impacts resulting from the Proposed

Action or its alternatives. To be considered significant, cultural resources must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register. The term eligible for inclusion includes both properties formally determined as such (by the Department of the U.S. Navy and the Hawaii SHPO) and all other properties that meet the listing criteria. Final determination of eligibility for inclusion in the National Register is made by the Keeper of the National Register. Sites which have not yet been formally evaluated are considered potentially eligible and, as such, are afforded the same regulatory consideration as formally nominated properties. Prehistoric (usually referred to as archaeological), historic, or traditional significant cultural resources are referred to as historic properties.

An undertaking is considered to have an effect on a historic property when it may alter characteristics of the property that may otherwise qualify the property for inclusion in the National Register. An effect is considered to be adverse when it diminishes the integrity of the property s location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include but are not limited to:

- The physical destruction, damage, or alteration of all or part of the property
- Isolation of the property from, or alteration of the character of, the property s setting when that character contributes to the property s qualification for the National Register
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting
- Neglect of a property resulting in its deterioration or destruction
- Transfer, lease, or sale of the property

(3 CFR 8 . b)

Previous surveys of PMRF have identified prehistoric and historic archaeological resources in several locations throughout the installation including the Nohili Dune, which is considered eligible to the National Register (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3-1). In addition to these resources, PMRF also possesses several potentially significant 13
historic World War II and Cold War period buildings and structures (see table 3.1.1. -2 U.S. Department of the Navy, 1 , Aug, p. through 2). 1

4.1.1.4.1 No-action Alternative— Cultural Resources, PMRF/Main Base

The No-action Alternative assumes a continuation of PMRF s primary mission (see section 2.2), which includes normal range training and operations and base operations and ~~base operation~~ maintenance activities. Under the No-action Alternative, potential adverse impacts to shoreline archaeological and historic resources from amphibious, RIMPAC, and National Guard exercises conducted at the installation are avoided by the current practice of pre-surveying potential landing areas and avoiding those with potentially significant sites, especially in the Ma or s Bay and Nohili areas.

Impacts to archaeological and historic resources from launch activity mishaps, construction, ground clearing, military related off-road traffic activities, sound pressure damage (to buildings and structures) from current rocket launch operations, inadvertent ignition of vegetation and subsequent fire suppression activities, and increased human presence as a result of training or maintenance operations in archaeologically sensitive areas are effectively avoided or minimized by current mitigation practices at PMRF. Recreational off-road activities, if not sub ect to the same mitigations, could result in adverse effects.

4.1.1.4.2 Proposed Action— Cultural Resources, PMRF/Main Base

Under the Proposed Action, facilities construction, instrument siting, and launch operations would be considered at proposed sites B, D, and E in the northern portion of PMRF.

Potential adverse effects to sensitive prehistoric cultural resources near the shoreline area and to one potentially National Register eligible site (theNohili Dune) could occur as a result of pro ect ~~implementation~~ construction and future operational activities. Construction-related activities may include ground-clearing, subsurface excavation disturbances, construction-related vibrations, and a potential for increased vehicular traffic activity through the beach and shoreline areas.

Potential impacts to cultural resources could also result from an increase of construction~~,~~ and operations support personnel at these proposed locations. The potential for unauthorized removal impacts would be manifested through the disturbance of historical properties and/or archaeological and historic resources. Other adverse effects to cultural resources within the vicinity of proposed sites B, D, and E could ~~also~~ occur as a result of debris generated by a launch pad mishap or as a result of an accidental launch vehicle ground strike. Impacts to cultural resources may also occur as a result of the ignition of vegetation from missile exhaust and debris and from subsequent fire suppression activities.

Cumulative impacts to cultural resources under the Proposed Action could result from an increased presence of personnel resulting in the incidental unauthorized removal of cultural materials and/or destruction of sites due to increase vehicular (recreational and operations related) traffic along shoreline and sand dunes in these areas.

PMRF can accommodate siting needs for targets, interceptors, and instrumentation at sites B, D, and E without causing adverse effects to cultural resources. Mitigation measures applicable to cultural resources at these locales would be the same as those addressed in the No-action Alternative. A detailed cultural and historical survey of the Nohili, Mana, and the western area of Kauai has been prepared as well (U.S. Army Strategic Defense Command, 1 3, Jul, p.i through I-1). 1

Mitigation measures to reduce and/or eliminate any potential adverse effects to historic resources at these locations would be formulated by the Navy in accordance with PMRF s ICRMP (Inouye, 1 8, 28 Jan). The Navy is in the process of establishing a Memorandum of Agreement, in consultation with SHPO, for cultural resource management related to the Proposed Action, as well as a programmatic agreement to address long-term PMRF activities (see appendix N).

Through the implementation of the appropriate monitoring, consultations with SHPO Hawaii, and by following U.S. Navy and PMRF s ICRMP, adverse impacts to cultural resources would be reduced and/or eliminated at the locales under consideration(see appendix K).

4.1.1.5 Geology and Soils— PMRF/Main Base

The physical structure or chemical composition of soils and underlying rock in the PMRF/Main Base area could potentially be affected by proposed construction or launch activities. The region of influence for this resource includes the land within the PMRF/Main Base complex identified for potential new construction, and ground hazard areas associated with proposed launch facilities.

4.1.1.5.1 No-action Alternative— Geology and Soils, PMRF/Main Base

4.1.1.5.1.1 Land-Based Training and Operations

The launching of solid propellant boosters has the potential to emit hydrogen chloride, aluminum oxide, and lead oxide. However, analysis conducted for the systems launched from PMRF concluded that these solid propellant emissions do notadversely impact the local soil environment (U.S. Army Strategic Defense Command, 1 2, Feb, p. -3). 13

Lead soil contamination from PMRF and KTF launch activities has been discovered on PMRF in the immediate vicinity of the Vandal launch pad and the KTF launch area. Lead levels at both locations were determined not to represent a public or worker health and safety risk as described in section 3.1.1. .2.3 (U.S. Department of the Navy, 1 , Jan, p. 3 through , 1
Department of Energy, 1 2, Jul, p. 2). 1 2

4.1.1.5.1.2 Base Operations and Maintenance

Under the No-action Alternative, PMRF would continue to conduct minor base maintenance activities, which may include some base improvement construction pro ects (such as trenching for infrastructure improvements). These pro ects would result in minor ground disturbing activities, which have the potential to disturb soils and cause minor erosion. However, the disturbance from these construction pro ects is short-lived, and the base implements best management practices to reduce soil erosion.

No other activities that would result in cumulative impacts to geology and soils have been identified.

No mitigation measures for geology and soils are proposed.

4.1.1.5.2 Proposed Action— Geology and Soils, PMRF/Main Base

The Proposed Action includes new construction of a target launch facility and an interceptor launch area, with potential modifications to the existing Strategic Target System launch pad, existing rail-launch pad, laboratories, and buildings. The Proposed Action will also result in the launching of target and interceptor missiles, which may emit fuel residues, or createspills which potentially could contaminate the soil in the vicinity of the test launch.

No adverse impacts to soils are likely to occur as a result of new launch pad construction because the proposed sites are located in modern alluvial and dune sands unsuitable for agricultural development. Soil disturbance would be limited to the immediate vicinity of the launch pad, and approximately 1 2 m (ft) for an associated service road. In addition, there may be some ground disturbance associated with temporary fuel storage areas. New construction will be of short duration. Soils at the proposed launch pads may be sub ect to minor erosion from the wind during the construction period. Base personnel will exercise best management practices to reduce soil erosion.

Proposed target missile launches at PMRF will use solid and liquid fuel propellants, whereas solid fuel propellants will be used exclusively for interceptor launches. Potential soil contamination could occur from rocket emissions forming hazardous residues in concentrations which would dictate a hazard to human health, or, in the event of an early flight termination, burning fuel may reach the ground. During nominal launches of a solid propellant missile, the primary emission products would include hydrogen chloride, aluminum oxide, carbon dioxide, carbon monoxide, nitrogen, and water.

No adverse changes to soil chemistry are predicted to occur as a result of hydrogen chloride or aluminum oxide deposition from solid fueled target and interceptor launches. As described in the Air Quality section, soil deposition of hydrogen chloride is expected to be minimal because relatively small amounts of hydrogen chloride are released in the booster ground cloud and the emissions disperse rapidly. Typically, no solid propellant missile launches would occur during rain, and the launch system would not use a water deluge system for cooling and noise suppression (a deluge system could increase the potential for ground deposition). No measurable direct or indirect, short-or long-term effects on soil chemistry are expected.

Potential deposition of aluminum oxide per launch is expected to be small relative to the levels of aluminum present in the soil. Previous studies performed by the Department of Energy to evaluate the impact of potentially launching Strategic Target Systems at KTF measured high background levels of aluminum in the soils of the Mana Plain (see section 3.1.1. 2~~3~~). Soil deposition of measurable levels of aluminum oxide from a moving exhaust cloud is predicted to be negligible (U.S. Army Strategic Defense Command, 1 2, Feb, p. -3). Additionally, because 13
~~of~~ the launch location is on the western side of the island, the launch tra ectory is away from the island, and there are strong persistent wind conditions, it is expected that very little of these emissions will be deposited at PMRF.

In the unlikely event of an on-pad fire or early flight failure over land of a solid propellant missile, most or all of the fuel would likely burn up before being extinguished. Any remaining fuel would be collected and disposed of as hazardous waste. Potential soil contamination which could result from such an incident is expected to be very localized.

An on-pad spill or catastrophic missile failure of a liquid-fueled missile over land could result in the release of UDMH fuel and/or IRFNA oxidizer. UDMH is heavier than air, and if not oxidized when airborne will react and/or possibly~~e~~ ignite with the porous earth or will form dimethylamine and oxides of nitrogen. All of these substances are soluble in water. On further oxidation of the dimethylamine, the amino substances serve as nutrients to plant life. Airborne nitrogen dioxide would return to earth as nitric acid rains in precipitation

events and would react with the calcium carbonate soil to form the nitrates which are used in fertilizer for plant life (U.S. Army Space and Strategic Defense Command, 1 , 2 May, p. -2
through -21). 13

Likewise, IRFNA that reached the ground would react with~~the~~ calcium carbonate soils to form
calcium nitrates (U.S. Army Space and Strategic Defense Command, 1 , 2 May, p. -21). 13
Calcium nitrate, a strong oxidizer, is a dangerous fire risk in contact with organic materials, and may explode if shocked or heated (U.S. Army Space and Strategic Defense Command, 1 ,
2 May, p. -21). Therefore, depending on the amount of the propellant and/or oxidizer 13
released, soils contaminated with these liquid propellants may require removal to prevent subsequent fires or explosions. Calcium nitrate is also water soluble, so it is anticipated that any residual material or unreacted fuel would be washed into the groundwater or directly out to sea.

Testing of soils near existing launch sites has shown no soil contamination resulting in public health and safety risks, with most soil chemical levels at ambient conditions. It is expected that the increased launches under the Proposed Action would not result in any cumulative impacts to soils. If any cumulative impacts do occur, they would be limited to the area immediately around the launch site. Elevated levels of some solid propellantparticulates in the areas around the launch sites may occur however, this should be localized and would not result in any health risk.

Specific mitigation measures could include frequent watering of excavated material and/or the use of soil additives to bond exposed surface soils. No solid propellant missile launches would occur during rain, and the launch system would not use a water deluge system for cooling and noise suppression.

4.1.1.6 Hazardous Materials and Hazardous Waste— PMRF/Main Base

4.1.1.6.1 No-action Alternative— Hazardous Materials and Hazardous Waste, PMRF/Main Base

4.1.1.6.1.1 Land-Based Training and Operations

No adverse impacts would result from hazardous materials and hazardous waste used in the continuation of the No-action Alternative. PMRF activities have resulted in minimal impacts to the environment from the use of hazardous materials and the generation of hazardous waste. Section 3.1.1. provided the amount of hazardous waste generated by all of PMRF activities in 1 (2,2 kg 88, lb ~~) in 1)~~. The No-action Alternative would generate similar amounts and types of hazardous waste. PMRF has the appropriate plans in place to manage the hazardous materials used and waste generated. PMRF activities follow the appropriate State and Federal requirements for the management of hazardous materials and hazardous waste. In addition, the implementation of pollution prevention programs on base has resulted in over a percent reduction in hazardous waste generated since 1 . The recent implementation of a pharmacy system on base to control the use of hazardous materials should further reduce the amount of ~~hazardous materials used and hazardous~~ waste generated. All hazardous materials and hazardous waste would continue to be shipped in accordance with DOT guidelines. The IRP sites on base are in the process of being closed.

~~The~~ Hhazardous materials used and hazardous waste generated from both solid and liquid propellant missiles during launch activities at PMRF including any potential mishaps under the No-action Alternative have been previously analyzed and determined not to result in any significant impacts to the environment (U.S. Army Strategic Defense Command, 1 2, Feb p. - Sandia National Laboratories, 1 2, Jul p. Strategic Defense Initiative Organization, 13 , 8 1 1, Jul, p.3-2). As discussed in that document, cleaning solvents and water-diluted liquid 11 propellant solutions would be managed under and comply with the PMRF RCRA-generator permit.

Contingency plans are in place to deal with any emergency that may arise from the activities conducted at PMRF and supporting sites~~. Lead soil contamination from past PMRF and KTF launch activities has been discovered on PMRF in the immediate vicinity of the Vandal launch pad and the KTF launch area. Lead levels at both locations were determined not to represent a public or worker health and safety risk (U.S. Department of Navy, 1 , Jan, p. 3 through U.S. Department of Energy, 1 2, Jul, p. 2)~~.

4.1.1.6.1.2 Base Operations and Maintenance

Operations at the KTF would continue to support weapons research and development activities under the No-action Alternative. The types and amounts of hazardous materials and waste under the No-action Alternative would be similar to those addressed in the *Kauai Test Facility Environmental Assessment*, July 1 2, which resulted in a Finding of No Significant Impact. The EA concluded that operations at the KTF would not result in any significant hazardous material and waste impacts. Only small quantities of solvent waste are generated during no-launch activities. Propellant wastes are generated in the unlikely event of an accident. Any hazardous wastes generated are transferred to PMRF for handling in accordance with applicable hazardous waste management requirements.

No other activities have been identified that would result in cumulative impacts to the environment from the use of hazardous materials and generation of hazardous waste at PMRF under the No-action Alternative. The past use of these materials, as described in section 3.1.1. , has resulted in some ground contamination at PMRF, which is currently being remediated. However, the use of hazardous materials and generation of hazardous waste at PMRF have not resulted in any long-term impacts to the environment.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.1.6.2 Proposed Action— Hazardous Materials and Hazardous Waste, PMRF/Main Base

The Proposed Action would include all of the components of the No-action Alternative and the enhancement of PMRF so that it can accommodate the development and operational testing associated with the TBMD and TMD programs. The TBMD and TMD programs at PMRF would include construction of new facilities, target missile systems launches (land-, air-, and sea-based), defensive missile launches (land- and sea-based), sensor systems, range operations and training, and base operations and maintenance. It is expected that the Proposed Action activities would result in an overall 1 percent increase in the amounts and types of hazardous materials used and hazardous waste generated at PMRF. Most of this increase in hazardous materials would result from the approximately 3 percent increase in hypergolic fuels handled. This increase would be associated with direct amounts required for the proposed TBMD and TMD programs as well as indirect amounts required for increased base operations and maintenance required to support these programs. The types of hazardous materials used and waste generated would be similar to those currently used at PMRF except for some liquid fuels described below. The increase in hazardous materials used would be closely monitored through the PMRF pharmacy system, which would minimize excessive use. ~~of these materials.~~ The increase in hazardous waste generated would still be well below total amounts generated at PMRF in the past (1). The existing accumulation points on PMRF have ample storage area to meet the increase in hazardous waste generated, and no new storage facilities would be required.

4.1.1.6.2.1 Facility Construction

Construction of new facilities would be conducted in accordance with the Corps of Engineers Safety and Health Requirements Manual. Before any facility modifications, the areas to be modified would be surveyed for asbestos and lead-based paint. These materials would be removed in accordance with Federal and State regulations prior to building modifications. The hazardous materials used and hazardous waste generated from construction activities would be minor and handled in accordance with Federal and State regulations. All construction activities would follow the PMRF spill control plan.

4.1.1.6.2.2 Target and Defensive Missile Launches

Under the Proposed Action, there would be an increase in the number of both solid and liquid propellant missiles launched from PMRF, including the KTF area. The solid propellants would be similar to past systems launched from PMRF and would follow the same hazardous materials and hazardous waste handling procedures developed under existing plans described in the affected environment. The types of hazardous materials used and hazardous waste generated would be similar to current materials and would not result in any existing procedural changes to the hazardous materials and hazardous waste management plans currently in place.

IRFNA and initiator fuel (starter fuel) required on some targets have not been previously handled at PMRF, although hydrazine and NTO, which present similar hazards, have been, and similar procedures would be used. The existing spill plans, emergency response plans, and hazardous materials and hazardous waste plans would be modified to include these materials before they would be used at PMRF. In addition, the PMRF Fire Department and Hazardous Materials Response Team would be trained in the appropriate procedures to handle these materials should a mishap occur. A liquid propellant accident response plan is in place and will be updated as required. Monitoring is performed during transfer operations to ensure that no propellant releases have occurred, and all propellant transfer equipment is leak-checked prior to use. Propellant transfer operations (from storage vessels to the missile) would take place on the concrete pads with the appropriate spill containment devices. All personnel involved in these operations would wear protective clothing and receive specialized training in liquid propellant safety and handling and spill containment and cleanup. It is anticipated that only very minor amounts (approximately 1 g . oz) of oxidizer vapors would be released per operation to the atmosphere during the oxidizer transfer operation. A negligible amount of fuel vapors would be released per operation into the atmosphere during the fuel transfers. After completion of the transfer operations, the oxidizer transfer system would be flushed with water. This operation is expected to yield approximately g (.2 oz) of nitric oxide gas released to the atmosphere and 2 8 L (gal) of a mild nitric acid solution (. percent) that will be collected and disposed of per applicable regulations. The fuel transfer system would be flushed with 2 8 L (gal) of ethyl alcohol, and the waste alcohol (with approximately g 1. oz of fuel in solution) would be collected and disposed of per applicable regulations.

The storage of liquid fuels on PMRF would occur in either temporary or permanent facilities with the appropriate spill containment devices in case a leak should occur.

Section .1.1. , Health and Safety, addresses the amounts of liquid fuels required and the appropriate health and safety measures. All liquid propellant fuel spills would be remediated and hazardous waste generated would be disposed of in accordance with appropriate regulations.

During launches of either solid or liquid propellant missiles there is the potential for a mishap to occur resulting in missile potentially hazardous debris and propellants falling within the ground hazard area. As addressed for previous launch programs on PMRF, the hazardous materials that result from a flight termination would be cleaned-up and any contaminated areas remediated. All hazardous waste generated in such a mishap would be disposed of in accordance with appropriate State and Federal regulations.

Overall, no adverse impacts would result from hazardous materials used or hazardous waste generated under the Proposed Action.

Hazardous materials used and hazardous waste generated in the ocean around PMRF is addressed in section . .

In terms of the potential for cumulative impacts, the use of hazardous material and generation of hazardous waste at PMRF under the Proposed Action would increase levels by 1 percent over the No-action Alternative. PMRF has the appropriate procedures in place and capacity to handle this increase in material ~~s~~ usage. The expected amount of hazardous waste generated in combination with the Proposed Action and No-action Alternative would still be well below historical levels on PMRF. Multiple new liquid propellant missile launches would result in minor increases in the amount of hazardous waste generated. The combination of all programs on PMRF would not result in cumulative hazardous materials and hazardous waste impacts on PMRF. The HLB program proposed for KTF would use the Strategic Target System however, this one-time program would not result in any cumulative hazardous materials and hazardous waste impacts.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.1.7 Health and Safety— PMRF/Main Base

4.1.1.7.1 No-action Alternative— Health and Safety, PMRF/Main Base

Under the No-action Alternative, there would be no change in the type of operations that occur at PMRF and no increase in safety risks. Potential health and safety issues at PMRF are associated with fleet training exercises, land-based training and operations, and routine base operations and maintenance. As part of these operations, PMRF takes every reasonable precaution during planning and execution of operations, training exercises, and test and development activities to prevent in ury to human life or property.

4.1.1.7.1.1 Land-based Training and Operations

The health and safety issues associated with land-based training occur both on the shore and over the open water. Land-based training and operations activities include aerial target and missile launches, electronic warfare operations, sensor instrumentation operations, communication system operations, land-based training, and other miscellaneous exercises.

Aerial Target and Missile Launches

Missile and aerial target launch activities occur from PMRF LC on the northern part of the base and from two DOE KTF launch areas on the northern and southern ends of the base. The missile and aerial targets are launched from fixed or portable launchers using either solid or liquid propellants. Aerial target and missile launches are divided between pre-launch and launch activities. The following section provides an analysis of general launch scenarios conducted at PMRF. ~~Analysis of impacts of the Strategic Target System was conducted as part of the Final EIS for the Strategic Target System, May 1 2.~~

Pre-launch Operations

Missiles and support equipment may arrive at Pearl Harbor before final shipment to PMRF. Equipment is available at Pearl Harbor for the loading and unloading of missiles, and storage areas are available for the temporary storage of hazardous materials. From Pearl Harbor missiles and support equipment are shippedto PMRF by aircraft or by ship to Nawiliwili Harbor, then by DOD/DOT-approved over-the-road common carrier truck. The equipment is then placed in secure storage until assembly and launch preparation. Applicable safety regulations are followed in transporting and handling hazardous materials including those required by the State of Hawaii. PMRF establishes and maintains appropriateESQDs around facilities where ordnance is stored and handled. The ESQD is an area within which unauthorized personnel are not permitted during hazardous operations.

During transportation and handling of missile components there is the potential for a mishap to occur that could result in an explosion or fire involving the solid or liquid propellant. The type of protection afforded by the shipping containerswould ~~should~~ be sufficient to protect solid rocket motors from receiving the shock required to cause an explosion. It is more likely that the liquid and solid propellants would burn. The solid propellants would release exhaust components (specifically hydrogen chloride) which would irritate the eyes and skin of persons in the nearby area. The liquid propellants consist of those used for the Strategic Target System s upper stage and et fuel used in some Navy target drones. However, these types of transportation accidents are unlikely on Kauai given the in-place safety procedures used by PMRF during transportation and handling. All transportation at PMRF on Kauai roads is conducted in accordance with DOT and Hawaii transportation regulations.

At KTF, up to 2 8 L (gal) each of NTO and hydrazine are stored for use in the launch of the Strategic Target System. The transportation, handling, and storage of these liquid propellants are conducted in accordance with DOT regulations and established procedures in place at KTF and PMRF. The use of these fuels at KTF is included within the PMRF spill response plan. The transportation, storage, handling, and potential impact of the use of hydrazine and NTO at PMRF were addressed in the Strategic Target System Final EIS (U.S. Army Strategic Defense
Command, 1 2, Feb, p. - through - 8). The results of the analysis determined that the 13
area immediately dangerous to life and health (IDLH) as a result of a maximum probable spill would be contained within KTF. All unprotected personnel would be excluded during transfer operations and, therefore, no impacts to public health and safety would occur.

A pre-launch accident on the launcher or in the assembly building would be characterized by either an explosion and/or detonation of the missile propellants, or a situation in which the missile propellants burn without detonation or explosion. An ESQD surrounding the launcher is calculated based on the equivalent explosive force of all propellant and pyrotechnic materials contained on the flight vehicle. All potentially hazardous debris resulting from an accident on the launcher would be contained entirely within the ESQD, which would already have been cleared of unprotected personnel. The ESQD varies from missile to missile, but is typically 381 m (1,2 ft) (figures 3.1.1. -1 and 3.1-). Teams are available for fire suppression, hazardous materials emergency response, and emergency medical response during launch operations. There is the potential that toxic fumes from the burning propellant could pose a health threat however, modeling conducted for the Strategic Target System booster (the largest missile launched from PMRF) and the Talos booster (same first stage as the Navy Vandal) determined that an on-pad launch anomaly of either system would not endanger public health or safety in
the PMRF area (U.S. Army Strategic Defense Command, 1 2, Feb, p. - through -21 13
Strategic Defense Initiative Organization, 1 1, Jul, p.3- through 3-2). The other missiles 11
launched under the No-action Alternative would be smaller, would generate less emissions, and would not represent a health and safety issue.

Launch Operations

Safety and health hazards associated with launch operations can occur as a result of inhalation of exhaust products associated with normal operation impact hazard associated with a launch anomaly (explosion, crash, flight termination) and inhalation hazards from an abnormal launch (fire, crash, flight termination). The primary method for preventing the adverse safety and health effects associated with these occurrences involves the physical isolation of the area immediately surrounding the launch site, before launch. At no time shall individuals of the public be exposed to a probability of fatality greater than 1 in 1 million for any single mission and 1 in 1 million on an annual basis. This standard maximum risk to the public is less on an annual basis than the risks from accidents occurring in the home or in public. (Range Commanders Council, 1 , Feb, p.3-)

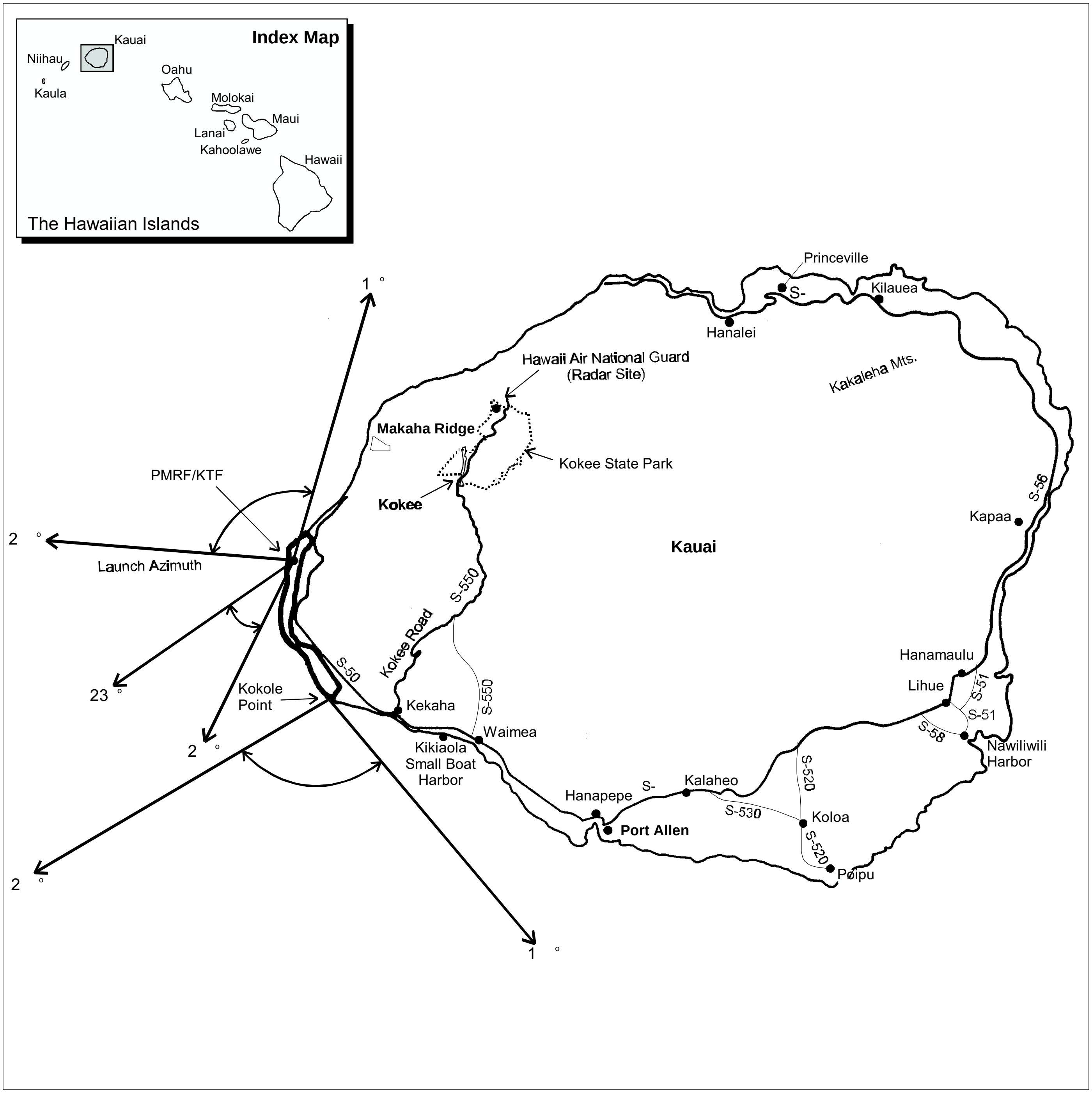
Before launch, a ground hazard area and launch hazard area are established to provide an area where all potentially hazardous debris from a launch anomaly would be contained. Non-mission-essential personnel are excluded from the ground hazard area during launch operations. Personnel working within the ground hazard area are protected in bunkers or behind berms. Numerous factors determine the shape and dimensions of the ground hazard area, including the following:

- Size and flight characteristics of the missile
- Individual flight profile for each exercise or flight test
- Reaction time between recognition of a flight malfunction and the decision to terminate flight

The ground hazard area size is determined by simulating the missile s capability to travel off course in any direction (3 degrees) from the launch point for a specified period of time. Five seconds is a commonly used time period, but this period can be modified based on local range procedures, capabilities, and mission requirements. The analysis assumes that at the end of the time period, the missile flight is terminated by the FTS and the associated debris falls to the ground or sea. The outer perimeter within which ~~this~~potentially hazardous debris could fall, in any direction, factoring in prevailing wind conditions, defines the boundaries of the ground hazard area.

Data processed by ground-based or onboard missile computer systems may be used to recognize malfunctions and terminate missile flight. The Safety Officer monitors the flight continuously and always retains the capability to terminate the flight, if necessary. For a typical aerial target drone, the nominal ground hazard area for launches extends to a radius of up to 3 m (1,2 ft). For ballistic missiles, the nominal ground hazard area is 1 m (2, ft) for unguided rail-launched targets and a modified 3, 8 m (1 , ft) for larger stool-launched guided missile targets (Lopez, 1 , 1 Dec, p.1). The Range Safety Officer determines actual 1
ground hazard area dimensions and safety procedures for each target or test missile flight, based on the above factors using computer models. To accommodate launches or larger missiles, PMRF has an existing restrictive easement for a ground hazard area of a modified 3, 8 m (1 , ft) that extends beyond the PMRF property boundary. The flight corridor azimuth limits are shown in figure .1.1. -1. Typical ground and surface water hazard areas are shown in figures .1.1. -2 and
.1.1. -3.

In addition to the ground hazard area, a launch hazard area would be established on the overwater areas where any potentially hazardous debris from a flight termination or missile stage could fall. The launch hazard area would be determined for each type of test, taking into account the same parameter as for the ground hazard area. Before launch, PMRF, as part of their routine operations, would determine that the launch hazard area is clear of non-participating aircraft and vessels by establishing warning and restricted areas, publishing NOTAMs through the FAA and NOTMARs through the Coast Guard, H DROPAC



EXPLANATION

Pacific Missile Range Facility Boundary

Flight Corridor Azimuth Limits

Kokee State Park Boundary

Note: PMRF Pacific Missile Range Facility
KTF Kauai Test Facility

NORTH

Scale

Kilometers

3

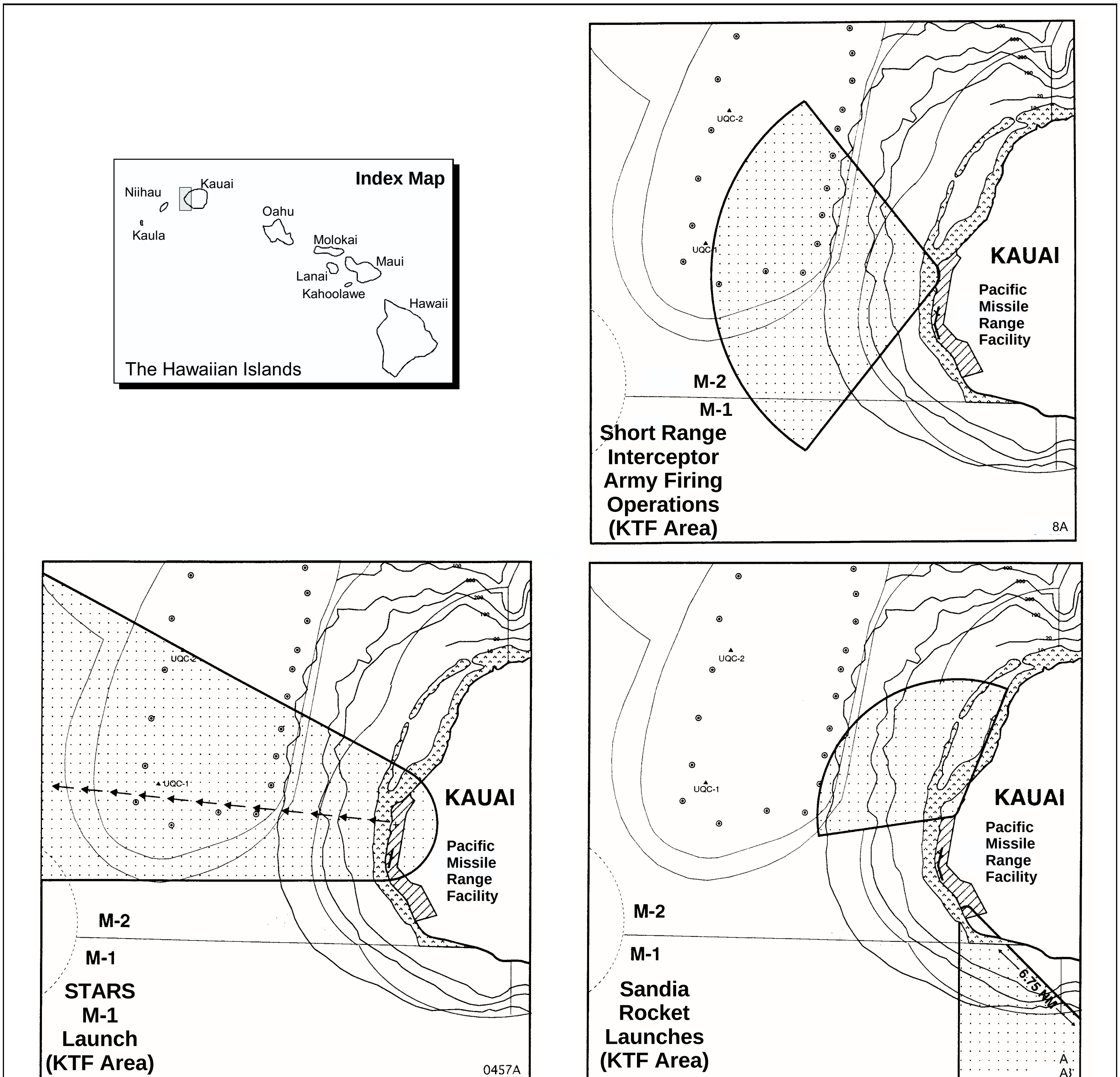
Miles

Pacific Missile Range Facility Flight Corridor Azimuth Limits

Kauai, Hawaii

Figure 4.1.1.7-1

pmrf hs 2



Source: Lawshe, J., 1 , 1 Dec, p.1.

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EXPLANATION

KTF Kauai Test Facility

Typical Ground and Surface Water Hazard Areas (KTF Area)

Kauai, Hawaii

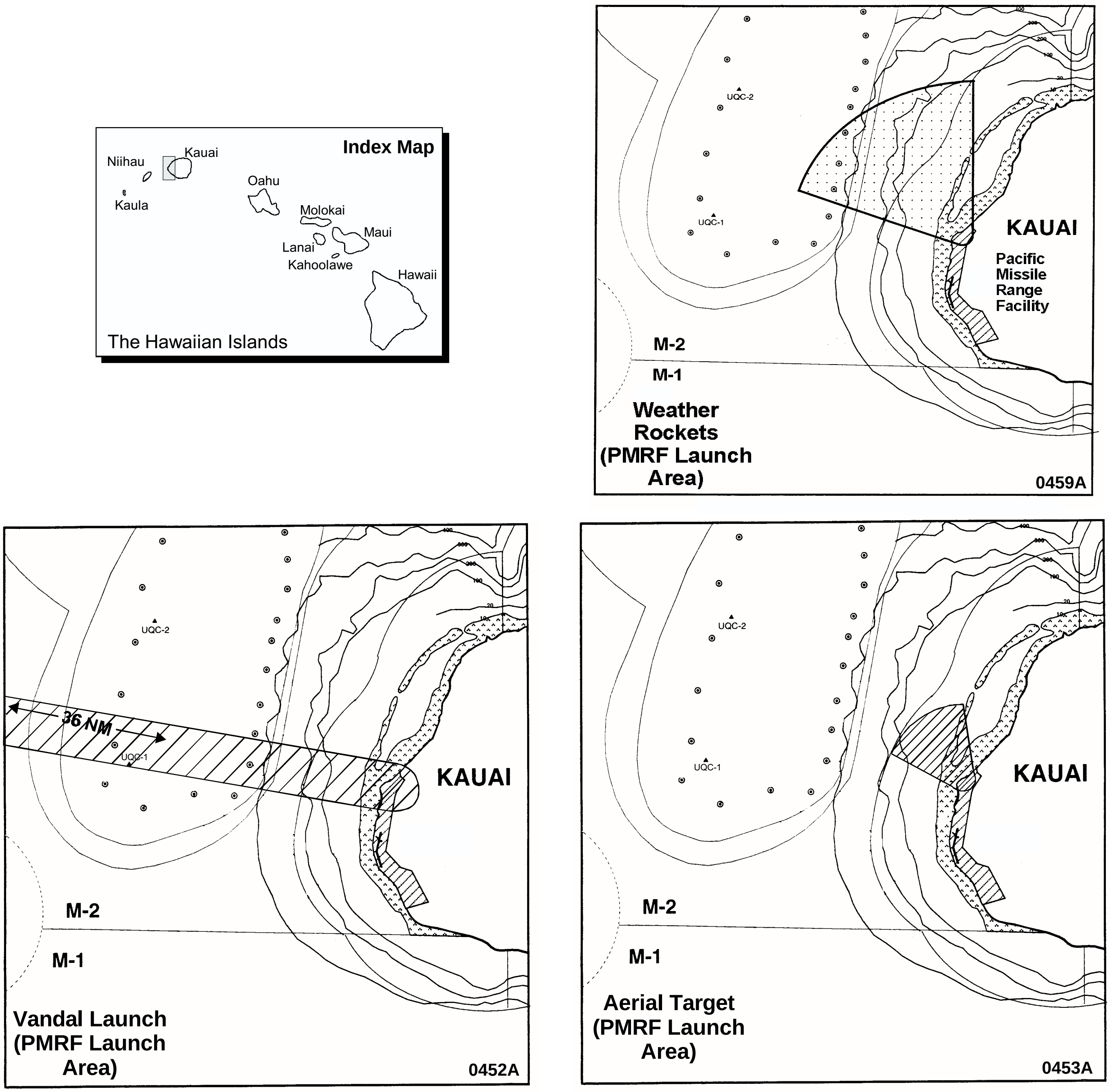
Scale

1 . Kilometers

3.3 . Miles

NORTH

Figure 4.1.1.7-2



Source: Lawshe, 1 , 1 Dec.

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EXPLANATION

PMRF Pacific Missile Range Facility

Typical Ground and Surface Water Hazard Areas (PMRF Launch Area)

Kauai, Hawaii

Figure 4.1.1.7-3

NORTH

Scale

. 1 . Kilometers

3.3 . Miles

pmrf hs

(a special type of NOTMAR), and by real-time coordination with agencies controlling both surface and air traffic. Area surveillance and clearance of the launch hazard area and determination that the stage impact areas are clear would be provided by PMRF aircraft and vessels. To further minimize the potential for launch associated hazards, PMRF would have its Missile Accident Emergency Team assembled for all launches from KTF and on an on-call status for PMRF launches in accordance with PMRFINST 1 .1F.

As a result of a nominal (successful) launch, the only identified potential hazard is the inhalation of rocket motor exhaust products released during the first few seconds of the launch operation. Concentrations are expected to be below applicable health-based standards~~reach undetectable levels~~ by the time the plume reaches the boundaries of the ground hazard area or launch hazard area, and thus people would not be exposed to concentrations exceeding the exposure limits. Modeling conducted for the Strategic Target System booster (the largest missile launched from PMRF) and the Talos booster (using same first stage as the Navy Vandal) determined that a normal launch of either system would not endanger public health or safety in
the PMRF area (U.S. Army Strategic Defense Command, 1 2, Feb, p. - through -21 13
Strategic Defense Initiative Organization, 1 1, Jul, p.3- through 3-2). In addition, air 11
monitoring for the solid propellant Strategic Target System launch showed that all exhaust concentrations were below applicable health-based standards at the ground hazard area south boundary. The other missiles launched under the No-action Alternative would be smaller, would generate less emissions, and would not represent a health and safety risk.

Termination of flight shortly after lift off would result in potentially hazardous debris being contained within the ground hazard area or launch hazard area where the public and non-essential personnel would be excluded. Personnel within the ground hazard area would be protected in bunkers or behind berms. Air emissions from the flight termination could pose a health threat however, modeling conducted for the largest solid propellant boosters for the 1,82 -m (, -ft) and a modified 3, 8-m (1 , -ft) ground hazard areas (Vandal and Strategic Target System, respectively) determined that all exhaust concentrations were below applicable health-based standards at each of the respective ground hazard area boundaries
(U.S. Army Strategic Defense Command, 1 2, Feb, p. - through -21 Strategic Defense 13
Initiative Organization, 1 1, Jul, p.3- through 3-2). 11

Potentially ~~H~~hazardous debris, which would impact the ground on the island should a flight termination occur, could present a health and safety risk. The material would consist of metals, solid propellant, and batteries (such as nickel cadmium and potassium hydroxide). Much of the hazardous material would be consumed in the launch anomaly. After such a flight termination or launch anomaly, potentially hazardous debris would be recovered from the ground hazard area and disposed of in accordance with Federal and State hazardous waste regulations. Most liquid propellants used in upper stages would be consumed in a flight termination and would not represent a health risk. As addressed under water resources and biological resources, any solid propellant that falls into the surrounding ocean would not affect water quality or contaminate fish used by residents for subsistence therefore, the pollutants would not enter the food chain and pose a health risk to island residents.

Termination of flight after the aerial target or missile has left the launcher would occur over open water within the launch hazard area which would be determined cleared of surface vessels and aircraft before launch. Because termination would occur over open water away from the public, it would not pose any public health risks.

Electronic Warfare Operations and Sensor Instrumentation Operations

EMR health and safety issues described below address hazards of EMR to people, fuel, and ordnance (HERP, HERF, and HERO, respectively). HERP hazards are the result of tissue heating by radio frequency energy. The cornea of eyes and the testicles are particularly sensitive to such heating effects, and effects such as formation of cataracts and temporary sterilization have been documented. In addition, there is some inconclusive evidence linking long-term EMR exposure to cancer. Hazard levels are a result of radio frequency energy averaged over any -minute period.

The hazard of EMR to fuel is the ignition of fuel vapors by arcing or ignition of fuel in contact with the RF heated metal in intense radio frequency fields. The hazard of EMR on ordnance is the potential to cause the ordnance to explode in intense RF fields.

Before installing any new radar or modifications, the Navy conducts an EMR hazard review that considers hazards of EMR on personnel, fuel, and ordnance. The review provides recommendations for sector blanking and safety systems.

The Navy conducts regularly scheduled radiation hazard surveys of the radar and other EMR generating equipment used on PMRF. None of the EMR generated affects the public using the beaches on PMRF or the areas ad acent to the facility. EMR hazards to personnel on PMRF are minimized by conducting hazard surveys of existing systems to ensure appropriate safety precautions are implemented. In addition, each radar unit contains warning lights which operate to inform personnel when the system is emitting EMR. Recommendations for HERP, HERF, and HERO provided in the EMR surveys are implemented. Overall, with the implementation of the existing safety procedures, EMR represents a minimal health and safety risk to personnel working on PMRF or the public.

EMR generated by radar on Naval ships would occur over the open water in areas verified clear of the public and would not present a public safety risk. Ship personnel are protected from EMR by maintaining safety areas around the radar units and using computer programs to block EMR hazards on the ship.

Communication System Operations

Under the No-action Alternative, communication systems consist of radio, microwave, and underwater communications time generation distribution and display systems and closed loop television systems. Because the operation of these systems does not emit any EMR or other hazardous emission or have appropriate safety zones in accordance with OSHA and Navy standards, they do not pose a health risk to personnel working on PMRF or to the public. These systems are contained within the boundaries of government property.

Land-based Training

Land-based training involves Army, HIANG, Army National Guard, and Marine Corps. These operations consist of mobile inshore undersea warfare exercise, amphibious exercise, RIMPAC exercise, downed pilot survival training, and helicopter terrain flight training. Most of these operations occur on PMRF and withinnearshore waters controlled by PMRF and do not involve the use of live ordnance. Prior to the start of any exercise, the area is determined cleared of the public. Use of aircraft as part of the amphibious training occurs within PMRF airspace and does not pose a health risk. Helicopter terrain flight training occurs over unpopulated portions of Kauai andNiihau and does not pose a public health risk. The covert penetration operations with the ob ective of reaching facilities atMakaha Ridge or on Niihau only involve military personnel trying to avoid detection by ground observers and do not involve any hazardous operations to the public.

Other Miscellaneous Exercises

PMRF conducts other miscellaneous exercises such as ballistic missile tracking, radar tracking, radar calibration, and supporting KTF operations. The only hazardous operations associated with these support activities is the generation of EMR emissions associated with radar tracking. Potential effects associated with radar EMR are discussed under electronic warfare operations and sensor instrumentation operations.

Research, Development, Testing and Evaluation Activities

These operations include torpedo, torpedo defense, submarine and periscope detection, submarine systems, anti-submarine warfare, ship-defense systems, land sensors, TBMD testing, and gunnery or special weapons tests. As discussed earlier, these types of operations occur within PMRF s determined cleared waters or land safety areas and do not pose a public safety and health risk. EMR emissions are discussed under electronic warfare operations and sensor instrumentation operations.

4.1.1.7.1.2 Base Operations and Maintenance

Operational support systems provided at PMRF include ordnance storage, aerial targets and surface targets support, range boat target and weapon recovery, marine pro ect support, air operations, diving support, visual imaging, instrument calibration support, meteorology, and oceanography activities. In addition, a host of military facilities available for military and contractor personnel are found at PMRF.

Ordnance

Under the No-action Alternative, a variety of ordnance would continue to be used and stored at PMRF. PMRF has extensive experience in the storage and handling of all types of ordnance and has specific safety instructions in place detailing handling procedures. Personnel involved in ordnance operations are trained at PMRF before any operation. Existing storage magazines and ordnance transfer and operation areas all have been sited in accordance with DOD safety standards and have appropriate ESQD arcs where unauthorized personnel and the public are restricted during use. The transportation of ordnance on Kauai roads is conducted in accordance with DOT and State transportation regulations. The continuation of ordnance activities under the No-action Alternative would not represent a public health and safety risk. The generation of hazardous waste from ordnance operations would continue to be handled in accordance with applicable USEPA, OSHA, and Navy regulations.

Aerial Target Support

Under the No-action Alternative, PMRF would continue to maintain and service aerial targets at the aerial targets compound and the target drone assembly facility. All maintenance operations are conducted by trained personnel and in accordance with OSHA and Navy safety guidelines. The use and generation of any hazardous materials from these operations are handled in accordance with applicable Federal and State guidelines. The continuation of these operations under the No-action Alternative would not pose a public health and safety risk.

Surface Target Support

Under the No-action Alternative, PMRF would continue to utilize surface target ships maintained at Port Allen. Specific safety issues associated with Port Allen are addressed in section .1. .3. Use of target ships occurs in the PMRF Warning Areas which are verified cleared prior to use as discussed under fleet training. The continued use of surface targets at PMRF would not represent a public health and safety risk.

Range Boat Support

Under the No-action Alternative, PMRF would continue to utilize range boat support at Port Allen. Specific safety issues associated with Port Allen are addressed in section .1. .3. Use of range support ships occurs in the PMRF Warning Areas which are verified cleared prior to use, as discussed under fleet training. The continued use of range boat support at PMRF would not represent a public health and safety risk.

Air Operations

Under the No-action Alternative, PMRF would continue to conduct aircraft operations using rates and types of aircraft described under baseline conditions. The threats to human safety from aircraft accidents at PMRF are summarized in the Navy AICU report. The purpose of the AICU report is to evaluate the effects of aircraft noise and accident potential, and develop and establish a means to ensure the health, safety, and welfare of the citizens of the surrounding communities while protecting the operational capabilities of PMRF. In order to minimize the risk to the public, a Clear one and Accident Potential ones have been designated. These airfield safety zones are either over open water or contained within the PMRF boundary (U.S. Department of the Navy, 1 , Oct, p.D-2 through D-2). Because most PMRF air operations occur over 1
unpopulated areas, the potential for an aircraft mishap to impact the public under the No-action Alternative would be remote. In addition, PMRF would continue to require that all flight operations be conducted in accordance with PMRFINST 3 1 .11E, *Air Operations Manual*. This document provides general operating procedures for aircraft operations, including radar hazard avoidance areas for ordnance, NOTAMs, red label operations, aircraft arrival and departure procedures, and flight rules for overflight of the islands of Kauai and Niihau.

Aircraft fueling at PMRF follows established guidelines similar to any airport and represents only ~~a~~ minor health and safety risks. The use and generation of hazardous materials and waste from aircraft maintenance would follow Federal and State guidance and would not pose a health risk.

Diving Support

PMRF would continue to utilize diving support to maintain PMRF underwater areas. Diving would continue to be conducted in accordance with standard diving procedures. Diving support would not represent a public health and safety risk.

Visual Imaging

PMRF would continue to provide photography and video support for range operations. The use and generation of hazardous materials and waste from visual imaging would follow Federal and State guidance and would not pose a health and safety risk to the public.

Calibration Laboratory

PMRF would continue to provide calibration services in support of range operations. The use and generation of hazardous materials and waste from the calibration laboratory would follow Federal and State guidance and would not pose a health and safety risk to the public.

Meteorology and Oceanography

PMRF would continue to provide meteorology and oceanography services for range operations. The only potential safety issue associated with this activity is the generation of EMR emissions by the weather radar. EMR emissions are discussed under electronic warfare operations and sensor instrumentation operations.

4.1.1.7.1.3 Other Support Facilities

Support facilities would continue to be used and include those services used to maintain the day-to-day operations of the base such as housing, food services, emergency services, Navy exchange, recreation services, gas station, and the small arms range. The activities associated with these services would continue to be conducted in accordance with Navy and OSHA regulations. The use and generation of hazardous materials and waste from these services would follow Federal and State guidance and would not pose a safety and health risk to the public. The small arms range is currently inactive however, appropriate safety zones have been established around the range to prevent any health and safety risks should it be reactivated. Under the No-action Alternative, the emergency fire services would continue to meet the Navy s requirements for fire and crash safety.

4.1.1.7.1.4 PMRF Tenant Organizations

Under the No-action Alternative, tenant organizations would continue to operate at PMRF. These organizations include the HIANG, National Institute of Standards and Technology, Naval Undersea Warfare Center, KTF, Kauai Educational Association of Science and Astronomy Laboratory, and Dynasonde Array.

The operations that present a health and safety risk are associated with a mobile ground radar (HIANG), operation of generators (HIANG), directional array antennas (National Institute of Standards and Technology), torpedo target maintenance (Naval Undersea Warfare Center), launch operations (KTF), and the Dynasonde Array. Hazardous materials used and waste generated for these operations are managed in accordance with Federal and State guidelines and would not represent a health and safety risk.

Operations of the HIANG mobile ground radar occurs behind the guard facility or on a PMRF-approved location near the Nohili Ditch. As with any radar unit on PMRF, warning lights operate when the unit is emitting EMR. The locations where the mobile radar unit can operate provide adequate safety for base personnel and the public. When the unit is operating, the area within the EMR hazard is cleared. The location where the unit operates behind the guard facility is on a dirt mound so that the EMR does not affect personnel operating within the guard compound. Both the directional array and Dynasonde Array antennas have a 1. -m (-ft) EMR hazard zone around the units. This area is blocked from entry by small fences and has appropriate EMR warning signs.

Operations at the KTF would continue to support weapons research and development activities under the No-action Alternative. Safety issues include the launch of missiles, use of ordnance, use and generation of hazardous materials and hazardous waste, and radar units. These health and safety issues were addressed in the KTF EA, July 1   2, which resulted in a Finding of No Significant Impact. The EA concluded that operations at the KTF would not result in any significant public health and safety impacts. The analysis emphasized the handling and use of rocket motors and their potentially hazardous propellants. Accidental detonation of propellants or fuel spills were the principal hazards identified. While highly unlikely to occur, these events could result in in ury to KTF personnel. The observance of explosive safety distances and the fact that most occupied buildings at KTF are designed to withstand blastoverpressure minimize risks to personnel. Use of protective clothing would provide protection for KTF personnel involved in cleanup of fuel spills. Potential safety issues associated with missile launches were addressed earlier under the heading Aerial Targets and Missile Launches.

4.1.1.7.1.5 Ongoing Maintenance and Operations

Under the No-action Alternative, PMRF would continue to conduct ongoing maintenance and operations activities such as maintenance of facilities and operation of infrastructure, as well as the management of hazardous materials and hazardous waste. The main health and safety issue associated with these operations is the worker and public exposure to hazardous materials and hazardous waste. All hazardous materials used on PMRF are managed in accordance with OSHA and Navy regulations to minimize the potential for a mishap during the handling of these materials. If a mishap should occur, PMRF maintains a spill response plan and has trained personnel to respond, thereby minimizing public health and safety risk. Hazardous waste generated at PMRF is managed in accordance with Federal and State regulations. Lead soil contamination from past PMRF and KTF launch activities has been discovered on PMRF in the immediate vicinity of the Vandal launch pad and the KTF launch area. Lead levels at both locations were determined not to represent a public or worker health and safety risk (U.S. Department of Navy, 1   , Jan, p. 3 through   Sandia National 1
Laboratories, 1   2, Jul, p. 2). 8

As discussed above, with implementation of the PMRF standard operating procedures, no adverse health and safety risks would occur from implementation of the No-action Alternative.

Under the No-action Alternative, hazardous operations at PMRF would continue at levels similar to baseline conditions. At no time shall individuals of the public be exposed to a probability of fatality greater than 1 in 1 million for any single mission and 1 in 1 million on an annual basis at PMRF. This standard maximum risk to the public is less on an annual basis than the risks from accidents occurring in the home or in public. In addition, the public is not exposed to EMR emission, hazardous air pollutants, ~~or~~ hazardous materials, or hazardous waste from PMRF operations. Workers on base adhere to strict regulatory control when operating with these materials, which minimizes any long-term exposures to on-base personnel. Outside of PMRF, the only other hazardous operations in the area are associated with recreational activities and sugar cane production. There are no residential areas or urban areas in the region of influence, and the only members of the public who use the area are associated with the above activities. Based on these factors and other activities in the area, there is minimal potential for cumulative health and safety risk to the public from operations at PMRF. ~~in con unction with other activities in the area~~. The HLB program proposed for KTF would use the Strategic Target System within the proposed number of launches expected under the No-action Alternative and would not represent an increase in public health and safety risk.

No mitigation measures for health and safety are proposed.

4.1.1.7.2 Proposed Action— Health and Safety, PMRF/Main Base

The Proposed Action would include all of the components of the No-action Alternative and the enhancement of PMRF so that it can accommodate the development and operational testing associated with the TBMD and TMD programs. The TBMD and TMD programs at PMRF would include construction of new facilities, target missile systems launches (land-, air-, and sea-based), defensive missile launches (land- and sea-based), sensor systems, range operations and training, and base operations and maintenance.

4.1.1.7.2.1 Facility Construction

Construction of new facilities would be conducted in accordance with the Corps of Engineers Safety and Health Requirements Manual. Construction of new facilities is routinely accomplished for both military and civilian operations and presents only occupational related effects on safety and health for workers involved in the performance of the construction activity. The siting of launch facilities, ordnance facilities, and instrumentation would be in accordance with DOD standards taking into account HERO, HERP, HERF, ESQD, and other facility compatibility issues. Before any facility modifications, the areas to be modified would be surveyed for asbestos and lead-based paint. These materials would be removed in accordance with Federal and State regulations prior to building modifications to minimize the potential for construction worker exposure.

4.1.1.7.2.2 Target Missile Systems

Under the Proposed Action, target missile systems would be launched from air, sea, and land locations. For the PMRF region of influence, air and sea targets within the PMRF range or over international waters and land-based targets would be launched from PMRF.

Land-based targets launched from other locations (such as Niihau, Tern Island, and Johnston Atoll) are addressed under those specific locations within this EIS.

Land-based Target Launches

Land-based targets would be launched from various locations on PMRF/Main Base and KTF and would include single and multi-stage solid or liquid propellant boosters. These systems would require a 1 -m (2, -ft), 1,82 -m (, -ft), or a modified 3, 8-m (1 , -ft) ground hazard area at PMRF. These launch systems would make use of existing ground hazard areas at PMRF~~,~~. N~~n~~o new ground hazard areas or clearance procedures would be required for the Proposed Action.

Pre-launch Operations

The safety procedures involved in pre-launch and launch operations addressed under the Proposed Action would be the same as those used for the No-action Alternative, such as verifying areas clear and issuing NOTAMs and NOTMARs prior to launch. The types of solid propellant boosters used as targets would be similar to those currently used at PMRF. The transportation, storage, and handling of solid propellant boosters and the potential accident scenarios would be the same as described for the No-action Alternative. It is expected that up to 12 additional boosters could be used at PMRF per year. Because PMRF does not have adequate storage facilities for the additional boosters, new facilities would be constructed at Kamokala Magazines. The use of these additional boosters would not represent a significant increase in the potential health and safety risks to the public given the existing safety procedures in place and the experience PMRF has in handling these types of missiles. In addition, proposed targets would make use of existing launch systems for which previous handling procedures and safety issues have been addressed.

Some examples of the typical liquid propellants that could be used include UDMH, kerosene-based fuels, starter fuels, hydrazine, NTO, and IRFNA. Both hydrazines (UDMH as well as neat hydrazine) and NTO have been used previously at PMRF, and appropriate storage facilities and safety procedures are in place. While kerosene has also been used and transported at PMRF, IRFNA has not. IRFNA, however, presents very similar hazards as NTO and has the same transportation and storage requirements. All liquid propellants would be shipped to PMRF in single-use containers.

In the event the liquid propellants arrive at Pearl Harbor prior to shipment to PMRF, the containers would be placed in areas available for temporary storage of hazardous materials while awaiting final transport to PMRF. Any new liquid propellants proposed for use at PMRF would be stored in separate storage facilities with the appropriate safety design features (such as sun shade and containment devices) and safety distances. The storage facilities would either be temporary or permanent. Prior to new liquid propellants being brought to PMRF, appropriate safety procedures for the transportation, storage, and handling of these propellants would be developed and approved by the PMRF Safety Office. The transportation, storage, and handling and potential impact of use of hydrazines and NTO at PMRF were addressed in the Strategic Target System Final EIS. The results of the analysis determined that the area dangerous to life and health from a maximum probable spill would be contained within KTF, where all unprotected personnel would be excluded during transfer operations, and that no impacts to public health and safety would occur.

The liquids utilized as a propellant for some target missiles, UDMH (fuel), IRFNA (oxidizer), kerosene based-fuels, and starter fuels present safety concerns for the public, mission-essential personnel, and those engaged in fuel transfer. The typical amounts used would be approximately 21 L (gal) of UDMH and 31 L (83 gal) of IRFNA for a pre-packaged fueled target missile, and 1,83 L (8 gal) of IFRNA and 1, 1 L (2 8 gal) of kerosene fuel (with coal tar distillates) and 3 L (gal) of initiator fuel for a target missile requiring fueling at PMRF. Some UDMH and IRFNA based targets would arrive at PMRF by air with the fuel already loaded into the system. The IRFNA/kerosene based target would be fueled at PMRF and would require storage of approximately ,2 L (1, gal) of IRFNA (thirty 2 8-l -gal drums), 3, L (gal) of kerosene (eighteen 2 8-L -gal drums) and 22 L (gal) of initiator fuel (two 11 -L 3 -gal drums). These fuels would only be temporarily stored at PMRF when required for a launch. No permanent storage would occur. These propellants could be transported to Pearl Harbor by commercial marine vessel or directly to PMRF by cargo aircraft. If marine transportation is used from the CONUS to Pearl Harbor, the propellants would then be transported to PMRF from Hickam AFB by air or from Pearl Harbor marine landing craft directly to PMRF or by commercial marine vessel to Port Allen or Nawiliwili Harbor, then by marine landing craft or roadway to PMRF. All transportation would be in accordance with DOT regulations. The liquid propellant would be transported in DOT approved shipping containers. In addition, the IRFNA 2 8-L (-gal) drums would be placed inside a second drum (DOT approved, 322 L 8 gal) as an additive protective measure for shipment.

UDMH-related health hazards include respiratory irritation and impairment of the blood, kidneys, and liver. The gases from IRFNA may cause severe burns, damage eyes, and damage skin tissue from either direct contact or inhalation. Although a poison, IRFNA is not a carcinogen. Personnel involved in handling of the propellants will wear fully encapsulated suits with supplied or independent air, escape air cylinder, and radios. K~~k~~erosene-based fuel is harmful by inhalation, ingestion, or by contact with eyes and skin. Inhalation of vapors may cause headache, nausea, weakness, and unconsciousness, and vapors may be aspirated into the lungs if swallowed. The chemical composition of kerosene-based fuel includes to 2 percent benzene, a class 2A carcinogen per the National Toxicology Program, International Agency for Cancer Research, and OSHA that is suspected to be a human carcinogen. Personnel involved in handling the kerosene-based fuel wear protective clothing with supplied breathing air, splash protection, and radios. The kerosene-based fuel is not as volatile as UDMH. Though stable, the fuel and its vapors are flammable, and oxygen and strong oxidizing agents should be avoided. Rapid combustion of air/fuel vapors or confined quantities of fuel can be explosive. (Ballistic Missile Defense Organization, 1 8, May, ~~U.S. Air Force, 1 Nov~~ p. -1) 21

Initiator fuel is moderately toxic by ingestion, skin contact, and inhalation is a severe skin and eye irritant and can cause kidney and liver damage. Personnel involved in handling the initiator fuel would wear fully encapsulated suits with supplied or independent air, escape air cylinder, and radios. Like UDMH, the initiator is explosive if vapors are exposed to heat or flame, or when heated under confinement. It will react with acids, oxidizing agents, and heat or flame, spontaneously causing fire.

Briefing of personnel regarding health hazards and allowing time after impact for dissipation or degradation of residual fuels would offset potential hazards. (Ballistic Missile Defense Organization, 1 8, May, ~~U.S. Air Force, 1~~ , ~~Nov,~~ p. -1) Hazards to personnel are 18
minimized by proof-testing all lifting hardware, annual inspections, personnel certification, propellant vapor concentration detectors, and the use of personnel protective equipment. The launch control van is placed upwind to minimize propellant vapor exposure risk. A propellant operations support trailer provides storage and transport of hazardous material response equipment and propellant detection equipment. Monitoring is performed during transfer operations to ensure that no liquid propellant releases have occurred, and all propellant transfer equipment is checked prior to use.

In the unlikely event that a target tankage sustains critical damage during handling, a propellant draining kit, composed of oxidizer and fuel draining kits, would allow safe draining of the propellant when in the field. A minimum three-member crew, outfitted with protective clothing and breathing apparatus, is required.

Air shipment of liquid target missile propellant oxidizer components is preferred. However, a waiver of the DOT prohibition of transportation of these chemicals by air would be necessary. Shipment by air would minimize potential exposure of the public to accidental spills of the IRFNA due to traffic or shipping accidents. The IRFNA would be packaged in DOT approved 2 8-L (-gal) drums contained inside a secondary 322-L (8 -gal) overpack drum. The IRFNA would then be transported. Following loading operations and again prior to takeoff, the secondary containment would be monitored to ensure integrity of the primary drum. The oxidizer would then be placed in storage on PMRF. The 2 8-L (-gal) aluminum drums have passed the DOT CFR 1 8. 3 Performance Oriented Packaging (POP) tests.

Potential impacts to public health and safety could be minimized since flight would be over open ocean areas directly onto PMRF. Potential impacts from in-flight emergency situations would be minimized through inspection to detect primary containment leaks prior to take off and periodically during flight.

Marine vessel shipment of IRFNA to PMRF could be accomplished either directly from the CONUS or via intermediate cargo transfer at Pearl Harbor. The intermediate transfer at Pearl Harbor should not significantly increase the probability of leakage since handling of hazardous materials at Pearl Harbor is routine, and proper training and procedures are in place. The shipments would occur on non-passenger vessels with placement of the materials on the deck of the vessel per DOT regulations. The IRFNA would be off-loaded for storage at PMRF via landing craft at Ma ors Bay. Potential impacts to public health and safety could be minimized since the transport route would be over open ocean, with the exception of entry to PMRF.

A spill of liquid propellant during transportation is not likely to occur. In a risk analysis study conducted for the transportation of large quantities of liquid propellant by truck to Vandenberg AFB from manufacturing plants in Mississippi and Alabama (U.S. Air Force 1 8 , Jul, p. -12), it was estimated that the accident rate would be 1. accidents per 1 million vehicle round-trip miles, if 1 shipments were made per year. A similar transportation analysis for shipment of liquid propellants on the Island of Hawaii determined that the highest risk was 3. accidents per 1 million miles traveled per year (State of Hawaii, Department of Business, Economic Development and Tourism, 1 3, Aug, p. -). Given the limited number of shipments, the small quantities involved, and the overall short distance that would be traveled on Kauai, the chance of a transportation accident would be significantly less than the risk analysis conducted forVandenberg AFB. In addition, because the IRFNA is double packed within two drums, the possibility of both drums breaking during an accident during transportation is extremely remote. To minimize the potential for any liquid propellant mishap on the island of Kauai, PMRF has developed the following transportation procedures: 1

- Trained spill response teams would be on standby for the transportation of all missile liquid propellants. Truck shipments on Kauai would have trained escorts.
- All shipments would be scheduled to avoid peak traffic periods for roads and to avoid high-use times for harbors.
- Local fire and police, and local area state transportation officials will be notified in advance of shipments, and informed by experienced personnel (and trained, if necessary) of existing safety procedures to be used during transportation on Kauai.
- Notice of shipment to State and local officials
- Propellant vapor leak check and liquid propellant containers inspection prior to off-loading propellant from ship and after loading propellant into trucks

Nonetheless, in the event that a transportation accident did result in a spill, there is a difference in the degree of risk to the public between the transportation alternatives.

PMRF has reviewed procedures for response to spills of hazardous substances and has revised the PMRF oil/hazardous substance spill contingency plan that integrates base plans for emergencies. Provided below is a discussion of an IRFNA or initiator fuel modeling scenario spill during transportation and handling. In addition, the potential for a prefueled liquid target system accident was also reviewed.

The operations that could result in the spillage of a liquid propellant include (1) delivery of the propellants to PMRF, (2) transfer of the propellants to the launch pad, (3) the loading operation, ( ) return of the unused propellant to the holding area, and ( ) a mishap during moving the missile or a launch initiation. The potential for spillage during other situations is considered remote since the propellant containers in the storage area will be checked for leaks on a weekly basis and after any launch that results in debris falling in the storage pad areas. Typically, only a single chemical is involved in an accident spill, thereby minimizing the likelihood of a explosive reaction. If a prefueled target missile were in an accident and both tanks ruptured, then a fire could result.

A spill is characterized as an evaporating liquid, or as a gaseous cloud that is generally neutral buoyant, or heavier than air. A class of dispersion models, commonly known as cold spill models, were developed to model the dispersion of neutrally buoyant or denser-than-air gases produced from liquid spills. The Air Force Toxic Program (AFTO) was used to model these releases and provide an estimate of downwind concentrations. Only cold spills were evaluated because, in general, spills involvingunreacted hypergolic propellants pose the greatest health hazard to human and ecological populations. IRFNA contaminates the surrounding atmosphere with nitric acid vapor, nitric oxide, and nitrogen dioxide (or its NTO). Consequently, a threshold limit value (TLV) for IRFNA has not been established. However, the atmospheric TLV for its more toxic components are 2 ppm for nitric acid vapor and ppm for nitrogen dioxide. Emergency exposure limits for nitrogen dioxide have also been set at 3 ppm for 1 minutes, 2 ppm for 3 minutes, and 1 ppm for minutes. The IRFNA IDLH level is 2 ppm. The initiator fuel is a / mix of triethylamine and diethylanilines. It has a TLV of 1 ppm and an IDLH of 2 ppm. Trained spill response teams would be on standby for all transportation of liquid missile propellants.

~~There is currently insufficient data pertaining to small containers such as drums and cylinders that would enable the computation of leakage or rupture rates per accident. However, all drums used would have passed the DOT CFR 1 8 3 POP tests.~~ The drums are a welded aluminum assembly designed to contain IRFNA and similar fluids. The drums are equipped with capped fill and drain openings. All drums used would have passed the DOT CFR 1 8. 3 POP tests. The most likely rate of leakage would be on the order of milliliters (ounces), which would be contained by theoverpack containers. To estimate the type and magnitude of impacts, therefore, catastrophic (and unlikely) events of instantaneous (1 seconds or less) spills of an entire 2 8 L (gal) tank were analyzed to evaluate the magnitude of the consequences. For purposes of modeling, each spill was based on a pool depth of . mm (less than .1 in.). A blanketing time (time to cover or remove the spill) of 1 and 3 minutes was used, which is considered conservative since during transportation and handling an emergency response team would be near the operation.

Spills of the liquid propellants were modeled using both 3 -minute and 1 -minute blanketing times and assuming an instantaneous spill (e.g., the entire container spills at once). The 1 -minute time was modeled to simulate the concentration level that would occur if the accidental spill was remediated within the time period by a hazardous materials emergency response team that would accompany trucks transporting or handling liquid propellants. Since the emergency equipment would be following the truck, the actual response time would be almost immediate. Since the IRFNA would represent the greatest potential for health and safety issues (2 ppm TLV and greater quantities), it was modeled using the AFTO . The results of modeling a 1 -minute spill indicated the 2 ppm TLV would be exceeded up to 3 m (1,21 ft) from the spill point. The 2 ppm IDLH level would be exceeded up to 8 m (2 ft) from the spill point. The results of modeling a 3 -minute spill indicated the 2ppm TLV would be exceeded up to 38 m (1,2 ft) from the spill point. The 2 ppm IDLH level would be exceeded up to 8 m (2 ft) from the spill point or the same time as the 1 -minute spill.

The spill of a representative prepackage target missile was also modeled using AFTO . The modeling was conducted for 31 L (83 gal) of IRFNA and 21 L (gal) of UDMH. This accident would result if one of the IRFNA or UDMH tanks within the booster system ruptured during transportation or handling. If both tanks rupture, a fire would result which would consume most of the propellants. As with any liquid propellant transportation on Kauai, an emergency response team would be following the missiles during transportation and would remediate any spill almost immediately. The results of modeling a 1 -minute ~~of~~ spill of the IRFNA tanks indicated the 2 ppm TLV would be exceeded up to 2 m (1,32 ft) from the spill point. The 2 ppm IDLH level would be exceeded up to 113 m (3 1 ft) from the spill point. The results of modeling a 3 -minute IRFNA spill indicated the 2 ppm TLV would be exceeded up to m (1, 31 ft) from the spill point. The 2 ppm IDLH level would be exceeded up to the same distance as for a 1 -minute spill. The results of modeling a 1 -minute spill for UDMH indicated the . ppm TLV would be exceeded up to m (1, 3 ft) from the spill point. The 8 ppm IDLH level would be exceeded up to 8 m (1 8 ft) from the spill point. The results of modeling a 3 -minute spill indicated the . ppm TLV would be exceeded up to 8 m (2, ft) from the spill point. The 8 ppm IDLH level would be exceeded up to 8 m (1 8 ft) from the spill point or the same distance as for a 1 -minute spill.

Launch Operations

Under the Proposed Action, launches would occur from either existing launch facilities or newly constructed launch pads on the northern portion of PMRF. Safety and health hazards associated with launch operations can occur as a result of inhalation of exhaust products associated with normal operation impact hazard associated with a launch anomaly (explosion, crash, flight termination) and inhalation hazards from an abnormal launch (fire, crash, flight termination). As addressed under the No-action Alternative, the primary method for preventing the adverse safety and health effects associated with these occurrences involves the physical isolation of the area immediately surrounding the launch site before launch. At no time shall individuals of the public be exposed to a probability of fatality greater than 1 in 1 million for any single mission and 1 in 1 million on an annual basis. This standard maximum risk to the public is less on an annual basis than the risks from accidents occurring in the home or in public (Range Commanders Council, 1 , Feb, p.3-).

The safety procedures for establishment of a ground hazard area and launch hazard area under the Proposed Action would be the same as the No-action Alternative. For ballistic missiles, the nominal ground hazard area is 1 m (2, ft) for unguided rail-launched targets, and a modified 3, 8 m (1 , ft) for larger stool-launched guided missile targets. Under the Proposed Action, only existing PMRF ground hazard areas would be used.

As a result of a nominal (successful) target launch, the only identified potential hazard would be the inhalation of rocket motor exhaust products released during the first few seconds of the launch operation. Concentrations are expected to reach undetectable levels by the time the plume reaches the boundaries of the ground hazard area or launch hazard area thus, people should not be exposed to concentrations exceeding the exposure limits. Modeling conducted for the largest solid propellant target boosters for the 1 -m (2, -ft), 1,82 -m (, -ft), or a modified 3, 8-m (1 , -ft) ground hazard area determined that all exhaust concentrations were below applicable health-based standards at each of the respective ground hazard area boundaries. For example, air monitoring for the solid propellant Strategic Target System launch at PMRF, which is the largest missile launched from PMRF within the modified 3, 8-m (1 , -ft) ground hazard area, showed that all exhaust concentrations were below applicable health-based standards at the ground hazard area south boundary.

Termination of target booster flight shortly after liftoff would result in potentially hazardous debris being contained within the ground hazard area or launch hazard area, where the public and non-essential personnel would be excluded. Personnel within the ground hazard area would be protected in bunkers or behindberms. During operations, personnel remaining outdoors within the launch hazard area, downwind of the launch, would wear appropriate safety equipment (e.g., respirator masks). Air emissions from the flight termination could pose a health threat however, modeling conducted for the largest solid propellant target boosters for the 1 -m (2, -ft), 1,82 -m (, -ft), or the modified 3, 8-m (1 , -ft) ground hazard area determined that all exhaust concentrations were below applicable health-based standards at each of the respective ground hazard area boundaries. (U.S. Army Strategic Defense Command, 1 3, 2 Jul) 1

Potentially hazardous debris which would impact the ground on the island should a flight termination occur could present a health and safety risk. The material would consist of metals, solid propellant, and batteries (such as nickel cadmium and potassium hydroxide). Much of the hazardous material would be consumed in the launch anomaly. After such a flight termination or launch anomaly, potentially hazardous debris would be recovered from the ground hazard area and disposed of in accordance with Federal and State hazardous waste regulations. Most liquid propellants would be consumed in a flight termination or launch anomaly and would not represent a health risk. However, with some liquid propellant systems (IRFNA/kerosene based), the flight termination would stop the fuel system, thus terminating thrust causing the target system to hit the ground or ocean depending on the time of termination. A termination shortly after lift off could impact the ground only causing one of the liquid fuel tanks to rupture. The result of a kerosene tank rupture would be similar to a petroleum spill which would quickly be responded to by the PMRF Fire Department and Hazardous Materials Response team. An IRFNA tank rupture has the potential to result in toxic gases being released. The PMRF Fire Department and Spill Response Team would quickly respond to such a mishap. If such a mishap occurred, the IDLH of 2 ppm for IRFNA would extend approximately 2 m (ft) from the mishap, assuming a complete fuel tank rupture, and leak over a 1 -minute spill time. However, since PMRF would respond to such a mishap, it is unlikely that an entire tank would rupture and spill unmitigated for more than a couple of minutes. A termination over the ocean would result in the target system impacting the water where the IRFNA would mix and dilute with the ocean. The kerosene would result in a petroleum spill on the water, which would be remediated by PMRF. If the flight termination results in rupture of both tanks, the fuels may be consumed in the fire.

As addressed under water resources and biological resources, any solid propellant that falls into the surrounding ocean would not affect water quality or contaminate fish used by residents for subsistence therefore, the pollutants would not enter the food chain and pose a health risk to island residents.

Termination of target booster flight after the missile has left the launcher would occur over open water within the launch hazard area, which would be determined to be clear before launch. Because the termination would occur over open water away from the public, it would not pose any public health and safety risks.

Sea-based Target Launches

Target launches from sea would be the same as for land based launches but would occur from a mobile facility either the MATSS (a converted dry-dock that would operate in the broad open ocean or in sheltered waters) or SLP (a converted Navy ship). These ships would transport the assembled target booster to a specified launch location. None of the target assembly for the sea-based launches would occur at PMRF. The issues associated with sea-based launches near Tern Island and Johnston Atoll are addressed under their locations within this ~~D~~EIS.

The launch of the sea-based targets would occur in the open ocean away from populated areas. Prior to each launch, the area would be determined clear of any unauthorized ships and aircraft. In addition, the launch hazard area and target and intercept debris impact locations would be determined clear prior to launch. The launch hazard area and debris impact locations would be over the ocean. If the target booster goes off-course, the system would be destroyed by activation of the FTS. Because the launch and flight of the sea-based targets would occur over the open ocean in areas determined clear of the public, use of the sea launch target does not represent a public health and safety risk. The potential ingestion of toxinsby ~~into~~ fish species which may be used for food sources would be remote because of the diluting effect of the ocean water and the relatively small area that would be affected.

Potential adverse impacts from sea-based liquid target launches should be minimal since propellant loading would occur either at Pearl Harbor or on the open ocean near the desired launch points.

Air-based Target Launches

Under the Proposed Action, some targets would be launched using an air launch vehicle, which would involve using a C-13 to transport the target booster to a predetermined point and then releasing the booster, which ignites at approximately 1, 2 m (, ft) above mean sea level. For PMRF, this system would be launched over the ocean. Health and safety issues related to the program include establishment of safety zones, missile debris impacts, transportation of components, explosive safety, and hazardous booster emission drops.

Transportation of the Air Drop system to PMRF for inspection prior to entering the range and use as a target would be by C-13 aircraft, which has an accident rate of 1 1^{-3} for every 1 million aircraft miles flown. The potential for an accident of the C-13 with the target booster would be remote and would not represent a safety hazard.

The pre-launch activities of preparing the booster for launch would be similar to any solid rocket motor and would be conducted in accordance with DOD and PMRF safety procedures. If a pre-launch mishap occurred during missile preparation, impacts would be the same as for land-based targets.

The launch of the target booster would occur over the open ocean, which would be determined clear prior to release of the booster from the aircraft. In addition, the launch hazard area and target and intercept debris impact locations would be verified clear prior to booster release. The launch hazard area and debris impact locations would be over the ocean. If the target booster goes off-course, the system would be destroyed by activation of the FTS. The FTS on the target booster has a predicted reliability of . percent. If the booster does not ignite, it would drop into the ocean and sink. Because the launch and flight of the system would occur over the open ocean in areas determined clear of the public, use of the air drop target does not represent a public health and safety risk. The potential ingestion of toxins by fish species which may be used for food sources would be remote because of the diluting effect of the ocean water and the relatively small area that would be affected.

4.1.1.7.2.3 Defensive Missile Systems

Under the Proposed Action, defensive missile systems would be launched from land and sea locations and would consist of single or multi-stage solid propellants. The divert attitude control on some payloads may contain very small amounts of prepackaged liquid propellants. The liquid propellants would be loaded into the payloads before their arrival at PMRF or other launch locations. At PMRF the defensive missile systems would require a 1,82 -m (, -ft) ground hazard area. Defensive missiles would be launched from locations on northern PMRF. These launch systems would make use of existing ground hazard areas at PMRF no new ground hazard areas or clearance procedures would be required for the Proposed Action.

For the PMRF region of influence, land-based defensive missiles would be launched from PMRF and sea defensive missiles from naval ships within the PMRF range. Land-based defensive missiles launched from Niihau are addressed under section .2.1. The safety procedures involved in pre-launch and launch operations addressed under the No-action Alternative would be the same as those used for the Proposed Action defensive missile systems, such as verifying areas clear and issuingNOTAMs and NOTMARs before launch.

4.1.1.7.2.4 Land-based Defensive Missile System Launches

Pre-launch Operations

The safety procedures involved in pre-launch and launch operations for the Proposed Action would be the same as those addressed under the No-action Alternative such as determining areas clear and issuingNOTAMs and NOTMARs prior to launch. The types of solid propellant boosters used as defensive missiles would be similar to those currently used at PMRF. The transportation, storage, and handling of solid propellant boosters and the potential accident scenarios would be the same as described for the No-action Alternative. Some defensive missile systems may require 1. L (. gal) of pre-packaged liquid propellants (such as hydrazine and NTO) for attitude control. The liquid propellants would be loaded into a sealed system within the missile prior to shipment to PMRF. The use of the additional defensive missiles would not represent a significant increase in the potential health and safety risks to the public given the existing safety procedures in place and the experience PMRF has in handling these types of missiles.

Launch Operations

Under the Proposed Action, launches would occur from either existing launch facilities or newly constructed launch pads on PMRF. Safety and health hazards associated with launch operations could occur as a result of inhalation of exhaust products associated with normal operation impact hazards associated with a launch anomaly (explosion, crash, flight termination) and inhalation hazards from an abnormal launch (fire, crash, flight termination). As addressed under the No-action Alternative, the primary method for preventing the adverse safety and health effects associated with these occurrences involves the physical isolation of the area immediately surrounding the launch site, which is performed before launch.

The safety procedures for establishment of a ground hazard area and launch hazard area under the Proposed Action would be the same as the No-action Alternative. For defensive missiles, the ground hazard area is 1,82 m (, ft). Under the Proposed Action, only existing PMRF ground hazard areas would be used.

As a result of a nominal (successful) defensive launch, the only identified potential hazard is the inhalation of rocket motor exhaust products released during the first few seconds of the launch operation. Concentrations are expected to reach undetectable levels by the time the plume reaches the boundaries of the ground hazard area or launch hazard area, and thus people should not be exposed to concentrations exceeding the exposure limits. Modeling conducted for the largest defensive missile ~~for the (~~(1,82 -m , -ft ground hazard area) determined that all exhaust concentrations were below applicable health-based standard.

Termination of a defensive missile flight shortly after liftoff would result in potentially hazardous debris being contained within the ground hazard area or launch hazard area where the public and non-essential personnel would be excluded. Personnel within the ground hazard area would be protected in bunkers or behindberms. Air emissions from the flight termination could pose a health threat however, modeling conducted for the largest defensive missile~~for the~~ (1,82 -m (, -ft) ground hazard area) determined that all exhaust concentrations were below applicable health-based standards. The 1. L (. gal) of prepackaged liquid fuel would be consumed in the flight termination.

Potentially hazardous debris that would impact the ground on the island should a flight termination occur could present a health and safety risk. The material would consist of metals, solid propellant, and batteries (such as nickel cadmium and potassium hydroxide). Much of the hazardous material would be consumed in the launch anomaly. After such a flight termination or launch anomaly, potentially hazardous debris would be recovered from the ground hazard area and disposed of in accordance with Federal and State hazardous waste regulations. Most liquid propellants within the payloads would be consumed in a flight termination or launch anomaly and would not represent a health risk. As addressed under water resources and biological resources, any solid propellant that falls into the surrounding ocean would not affect water quality or contaminate fish used by residents for subsistence therefore, the pollutants would not enter the food chain and pose a health risk to island residents.

Termination of the defensive missile s flight after the missile has left the launcher would occur over open water within the launch hazard area, which would be determined clear prior to launch. Because the termination would occur over open water away from the public, it would not pose any public health risks.

Sea-based Defensive Missile System Launches

Defensive launches from the ocean would be launched from a Navy AEGIS Combat System Ship using a vertical launch system. These ships would transport the assembled defensive missile to a specified launch location. None of the defensive missile assembly for sea-based launches would occur at PMRF.

The launch of the sea-based defensive missiles would occur in the open ocean away from populated areas. Prior to each launch, the area would be determined clear of any unauthorized ships and aircraft. In addition, the launch hazard area and defensive missile and intercept debris impact locations would be determined clear prior to launch. The launch hazard area and debris impact locations would be over the ocean. If the defensive missile goes off-course, the system would be destroyed by activation of the FTS. Because the launch and flight of the sea-based targets would occur over the open ocean in areas determined clear of the public, use of the sea launch defensive missile does not represent a public health and safety risk. The potential ingestion of toxins by fish species which may be used for food sources would be remote because of the diluting effect of the ocean water and the relatively small area to be affected.

4.1.1.7.2.5 Sensor Systems

Health and safety issues of EMR to people, fuel, and ordnance (HERP, HERF, and HERO, respectively) are described under the No-action Alternative. Prior to installation of any new radar or telemetry unit, the Navy conducts EMR hazard review that considers hazards of EMR on personnel, fuel, and ordnance. The review provides recommendations for sector blanking and safety systems to minimize HERP, HERF, and HERO exposures. The proposed systems would have the appropriate safety exclusion zones established prior to operation, and each unit would have warning lights to inform personnel when the system is emitting EMR. These systems would be located on PMRF and would not represent a public health and safety risk. The proposed systems would be similar to existing systems used on PMRF.

In terms of the potential for cumulative EMR exposure effects, it is important to note that no Federal standard has yet been promulgated for exposure to electromagnetic fields, let alone wildlife. The U.S. EPA has attempted to decide on an acceptable exposure limit, but without success. The EPA considered power density limits in therange of   .   mW/cm^2 to   mW/cm^2, the latter being the same as the U.S. Navy and 1 82 American National Standards Institute (ANSI) standard. The ANSI guidelines, as well as most all microwave protection guides, are based on the time-average value of exposure, i.e., the value of power density when averaged over any   -minute period. Thus, while   mW/cm^2 is permitted for   minutes or greater, the so-called continuous limit, higher values are acceptable if the exposure time can be limited to less than   minutes. For example, if the exposure time is only 3 minutes long, then 1   mW/cm^2 is acceptable if the exposure duration is only 1 minute, then 3   mW/cm^2 would be acceptable.

The concept of time averaging is important in consideration of the potential cumulative exposures that might occur near operating radars. Because tracking and searching radar beams move rapidly, depending on the particular mission or exercise, it is very unlikely that environmental exposures will ever consist of continuous, constant values of power density. Rather, almost universally, exposures will be intermittent and, when the radars are transmitting, the electromagnetic fields would be constantly changing in intensity. Thus, the potential for additive, incremental cumulative impacts from electromagnetic radiation exposure is extremely limited. Exposure analyses that do not take into account the fact that the radar beams will be almost constantly moving about will generally significantly overestimate the actual power densities that would occur during normal operations. Moreover, ground-level power densities would be controlled to values that do not exceed the relevant human general-population exposure values. Similarly, all ship-board radars would be in accordance with sound procedures and practices.

For some mobile defensive systems, portable radar units would be utilized. These units would have a personnel exclusion zone of 12 m (3 ft) to the front, and extending degrees to each side of the center of the radar during operation. Prior to system operation, personnel are determined clear of the exclusion zone, which would be contained within the PMRF boundary. In addition, location of these units would be near the ocean with the beam directed out over the open water.

EMR generated by radar on Navy ships would occur over the open water in areas verified clear of the public and would not present a public safety risk. Ship personnel are protected from EMR by maintaining safety areas around the radar units and using computer programs to block EMR hazards on the ship.

Aerostat could be used on ships during the TBMD and TMD operations in the ocean area. The potential health and safety issues are associated with EMR emissions and aircraft coming in contact with the tether cords attaching the Aerostat to the ground. As with any EMR operations, a survey addressing potential EMR emission to ship personnel would be conducted prior to using Aerostat. Aerostat would operate 1 m (3, ft) mean sea level above the ship, where there would be the potential for low-flying aircraft to come in contact with the system tethers or EMR emissions. To avoid any health and safety issues during operation, there would be a .8-km (3-mile) aircraft exclusion zone around the system. In addition, the system would have a transponder and beacon to warn aircraft.

4.1.1.7.2.6 Range Operations and Training

Under the Proposed Action, range operations and training would include those activities described under the No-action Alternative and include the fleet and land-based training of the TBMD systems.

The fleet operations and training would involve missile operations (target and defensive launches) and electronic warfare (sensor systems). The potential health and safety issues associated with these activities would be the same as described above for each element required to conduct the training.

The land-based operations and testing would include missile launches (target and defensive launches), electronic warfare, sensor-instrumentation operations, communication systems, and land-based training. The potential health and safety issues associated with these activities would be the same as described above for each element required to conduct the training for the Proposed Action and as described for the No-action Alternative.

4.1.1.7.2.7 Base Operations and Maintenance

Base operations and maintenance under the Proposed Action include those operations and maintenance activities described under the No-action Alternative except at a 1 percent increased rate to support TBMD and TMD activities. The potential health and safety issues would be the same as described for the No-action Alternative. The increased rate of these activities would slightly add to the potential for a mishap to occur during operations however, given that these operations are part of PMRF s routine procedures, the base has a vast amount of experience in conducting these activities, and the established safety procedures, the increase does not represent a significant public health and safety risk over that described for the No-action Alternative.

As discussed above, with implementation of the PMRF standard operating procedures and the mitigation listed below, no adverse health and safety risks would occur from implementation of the Proposed Action.

Under the Proposed Action, hazardous operations at PMRF would increase over baseline conditions. Over the past years, no accidents involving the public have occurred on PMRF or the ad acent range. At no time shall members of the public be exposed to a probability of fatality greater than 1 in 1 million for any single mission and 1 in 1 million on an annual basis at PMRF. This standard maximum risk to the public is less on an annual basis than the risks from accidents occurring in the home or in public. In addition, the public is not exposed to EMR emission, hazardous air pollutants, or hazardous materials and hazardous waste from PMRF operations. Workers on base adhere to strict regulatory control when operating with these materials, which minimizes any long-term exposures to on-base personnel. The proposed TBMD and TMD launches would represent an increase over the No-action Alternative. This cumulative increase in hazardous operations would increase the potential for a mishap to occur at PMRF or over the range however, given the existing safety precautions in place and the unpopulated nature of the area where tests would be conducted (i.e., no residential areas or urban area in the region of influence), the chance of the public being affected by such a mishap is remote. Outside of PMRF, the only other hazardous operations in the area are associated with sugar cane production, and the risks implicit with recreational activities by the public. Based on these factors there is minimal potential for cumulative health and safety risk to the public from operations at PMRF in con unction with other activities in the area. The HLB program proposed for KTF would use the Strategic Target System within the proposed number of launches expected under the No-action Alternative and would not represent an increase in public health and safety risk.

To minimize the potential for liquid propellant spills to affect surrounding areas, all launch pads and storage devices could be constructed with a containment or sump system to contain any spill and required remediation efforts.

4.1.1.8 Land Use— PMRF/Main Base

4.1.1.8.1 No-action Alternative— Land Use, PMRF/Main Base

4.1.1.8.1.1 Land Use

Under the No-action Alternative, PMRF would continue to conduct ongoing operations, and the area of land affected by these activities would not change. Current land uses ad acent to PMRF are agriculture, recreation, and a landfill. No inhabited buildings are within this area. These open-type uses with no development are compatible with the operations and safety requirements of PMRF. In addition, the States conservation and agriculture and the countys open and agriculture designations are compatible with base activities because they limit any development of a conflicting use.

4.1.1.8.1.2 Land-based Training and Operations

Land-based training and operations activities have the potential to impact land ad acent to PMRF. Land-based activities include missile and aerial target launch operations that have safety areas that extend beyond the base boundary. Use of this land requires activation of a restrictive easement. Land use impacts associated with use of the restrictive easement for the ground hazard area is addressed in section .1.2. .

4.1.1.8.1.3 Base Operations and Maintenance

Base operations and maintenance activities that affect off-base land use include airfield operations and the storage and use of ordnance. None of the airfield safety zones affect off-base areas however, some of the L_{dn} dBA and greater aircraft noise contours include off-base land. This area is used for sugar cane production and is considered a compatible use in accordance with Navy AICU guidelines. The noise contours are also compatible with the State and county agriculture zoning designations of this area. The ESQD that extends off base encompasses areas used for the development of sugar cane. The open nature of this use is considered a compatible land use. The ESQD arcs are also compatible with the State and county agricultural zoning designations of this area.

Land use on base is managed in accordance with the PMRF Master Plan, Navy, and DOD guidance in a manner that limits conflicting uses while still operating a military mission. All development on base adheres to safety guidelines, and any proposed conflicting use requires a waiver to be obtained from the appropriate office.

The continuation of activities at PMRF under the No-action Alternative would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. PMRF provides recreational opportunities along the coast to the public during times of non-hazardous operations and continues to maintain their beaches in a natural setting for the en oyment of the public. The recreational coastal opportunities provided at PMRF are not unique and can be provided elsewhere on the island. The base does manage and preserve historic and prehistoric resources in the coastal zone and allows public access as requested to areas significant to Hawaiian culture. The requirement for safety zones around PMRF has limited development, which has served to protect and preserve scenic and open spaces. Activities at PMRF are expected to have minimal impacts on biological resources.

PMRF has developed mitigations in previous documents to minimize potential biological resource impacts. Activities at PMRF have not affected local water quality in the ocean ad acent to the facility. PMRF provides facilities that are important to the Kauai economy and is vital to the island s economic stability.

4.1.1.8.1.4 Recreation

Recreational opportunities on PMRF are provided to both the public and base personnel. PMRF allows access by the public to their beaches during times of non-hazardous operations. Most of PMRF operations occur during times when the beaches are normally posted closed however, PMRF does try to maintain recreational area 3 open 2 hours a day. This area is the most requested beach by the public (2 percent) and provides the best recreational opportunities because of the open beaches. Under the No-action Alternative, the availability of the PMRF beaches would continue to be provided as posted, and closure for hazardous operations would be similar to those described under baseline conditions. Recreational area 1, which is requested 11 percent of the time, could be the most impacted with up to an additional 1, 2 hours of closure beyond normally posted hours. However, because of the low use (primarily fishing and general use), and because access to Barking Sands can be accommodated through the State Park, use would only be slightly affected. The beaches on PMRF only represent a small portion of the available beaches on western Kauai and do not provide any unique recreational coastal opportunities that cannot be provided elsewhere on the island. In addition, to minimize potential beach user conflicts, PMRF maintains a 2 -hour hotline which is updated daily to inform the public on which beaches would be closed.

Impacts associated with recreational use of Polihale State Park are addressed under the Restrictive Easement for the ground hazard area (section ~~(~~ .1.2).

Overall, no adverse impacts would occur to land use and recreation from implementation of the No-action Alternative.

In terms of cumulative impacts, the land use on the Mana Plain changed from an open natural setting to agricultural with the development of sugar cane in the early 1 s. This basic open use since this time and recreation uses on Polihale State Park have continued with minimal changes to the surrounding uses. The development of PMRF changed less than percent of the open and agricultural uses and has not contributed to cumulative land use changes. The safety zone requirements associated with PMRF preserve the open nature of the Mana Plain.

Operations on PMRF have reduced the number of hours the public can access the beaches in front of the base for recreational opportunities. PMRF does try to make these beaches available to the public except during hazardous operations. These beaches only represent a small portion of the beaches available on Kauai and do not provide any unique recreational uses. Activities on PMRF that restrict use do not represent a substantial cumulative loss of beaches on Kauai given the large areas still available.

No mitigation measures for land use and recreation are proposed.

4.1.1.8.2 Proposed Action— Land Use, PMRF/Main Base

Under the Proposed Action, PMRF would conduct TBMD and TMD activities and would continue those operations described under the No-action Alternative. As described for the No-action Alternative, operations at PMRF are compatible with surrounding land uses and zoning designations. Under the Proposed Action, PMRF would construct new facilities, conduct target and defense missile launch operations, and operate new radar facilities.

Construction of new facilities at PMRF would include defense and interceptor launch locations. Most construction would require a small clear pad or a stool launch pad. The proposed areas of development would occur in the KTF area or ust south of this area in compatible operation use areas. Siting and use of these areas would be conducted in accordance with DOD and Navy criteria, taking into account ESQD and EMR safety criteria. Most of the areas proposed for use would consist of existing launch pads, except sites B, C, and E. Sites B and C have previously been proposed as launch locations and met DOD and Navy safety compatibility criteria. Site E would also be compatible with existing land uses and safety criteria on PMRF.

The safety areas required for TBMD and TMD activities would make use of the existing ground hazard area areas established at PMRF as described under the No-action Alternative. No new ground hazard areas would be created, and the maximum time of activation of the restrictive easement would not increase beyond the current agreement with the State. As described under the No-action Alternative, the existing restrictive easement land areas are compatible with the agricultural and recreational uses they encompass. In addition, the restrictive easement land area is compatible with the State and county land use designations.

Under the Proposed Action, there would be less than a 1 percent increase in airfield operations, which would result in a minor increase in the aircraft-related noise contours that extend off-base. These contours would still range within the L_{dn} - dBA range and would be compatible with the agricultural use in accordance with Navy AICU recommendations.

Under the Proposed Action, there would be no other changes to the safety and hazardous operations described under the No-action Alternative that could affect off-base land use.

The activities at PMRF under the Proposed Action would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. The potential impacts of the Proposed Action on the Hawaii Coastal one Management Program would be the same as described for the No-action Alternative except for the additional beach closures and potential to impact biological resources, cultural resources, and water quality. However, with the implementation of appropriate mitigation measures, no impacts to biological resources are expected under the Proposed Action. PMRF would consult with the SHPO to ensure no cultural resources are affected by pro ect activities. Proposed construction and operations would not impact local water quality.

4.1.1.8.2.1 Recreation

Under the Proposed Action, there would be an increase in the number of hours of PMRF beach closures. Most closures would be associated with pre-launch missile ESQD related operations and would mainly affect recreational areas 1 and 2. The number of times the ground hazard area would be activated would not exceed 3 (up to 1 hours) currently allowed under the existing restrictive easement. Pre-launch activities would not affect recreation area 3 on PMRF, which is the most popular beach used on the base.

The proposed pre-launch activities at the new and existing launch locations on northern PMRF would affect recreational areas 1 and 2. It is expected that there could be an average of 1 launches from the KTF area including both the No-action Alternative and Proposed Action launches. Each launch would require 1 days of pre-launch activities that would require closure of the ESQD area for safety purposes. If these launches were to occur near recreational area 1, this would result in an additional closure time of 2, hours beyond when the area is normally closed. Under the posted access time, recreational area 1 can be available for up to ,1 hours per year. Under the Proposed Action combined with the No-action Alternative, this could be reduced to 3,21 hours of available use per year. The closure of recreation area 1 would not affect recreation areas 2 or 3 on PMRF and represents less than 3 percent of the total length of beaches available to the public on western Kauai and only 11 percent of the total use of the PMRF beaches. In addition, to minimize potential beach user conflicts, PMRF maintains a 2 -hour hotline which is updated daily to inform the public on which beaches would be closed so alternate plans can be made to use other PMRF or public beaches.

If the proposed launch pad is built near recreation area 2, this could result in additional closure of this area. It would be expected that up to four launches per year could occur from this proposed launch location. This would result in an additional closure time of 8 hours beyond when the area is normally closed. Under the posted access time, recreational area 2 can be available for up to , 28 hours per year. Under the Proposed Action combined with the No-action Alternative, this could be reduced to , hours of available use per year. Recreational area 3 would not be affected by closure of recreation area 2. As described above for recreation area 1 closures, this area only represents a small percentage of the available beaches on western Kauai and represents the lowest use area on PMRF. Other beaches on PMRF would be available during recreation area 2 closures.

Impacts associated with recreational use ofPolihale State Park are addressed in section .1.2. .

Overall, no adverse impacts would occur to land use and recreation from implementation of the Proposed Action.

Under the Proposed Action, there would be no change to the land uses because of PMRF activities. The potential for cumulative land use changes would be the same as described for the No-action Alternative.

The total cumulative impact to recreation on PMRF would be the same as described above for the Proposed Action, which takes into account all of the possible closure times that could occur on PMRF, including the proposed HLB program. Cumulative impacts from activation of the restrictive easement are described in section .1.2.

No mitigation measures for land use and recreation are proposed.

4.1.1.9 Noise— PMRF/Main Base

4.1.1.9.1 No-action Alternative— Noise, PMRF/Main Base

As described under the affected environment, the primary noise components on PMRF/Main Base are airfield operations, launch vehicle operations, and machinery operations. Under the No-action Alternative, PMRF would continue to generate noise levels similar to those described for baseline conditions. PMRF has established and maintains a hearing protection program that includes monitoring the hearing of those personnel exposed to high noise level and identifying and posting notification of noise hazard areas. Personnel required to work in noise hazard areas are required to use appropriate hearing protection to bring the noise levels to within established safety levels.

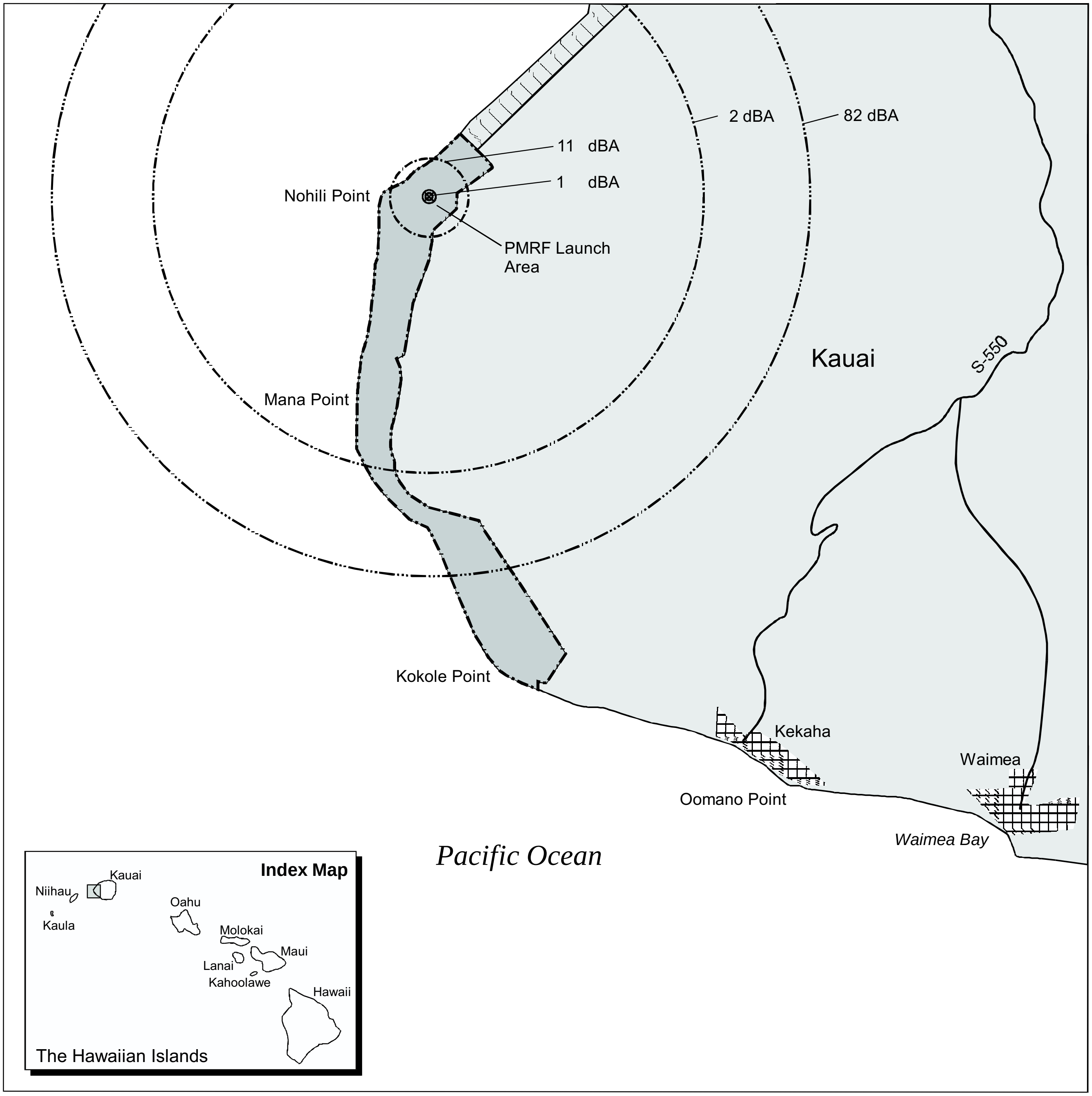
4.1.1.9.1.1 Land-based Training and Operation

Under the No-action Alternative, PMRF and KTF would continue to conduct missile launches from both northern and southern PMRF at rates similar to baseline conditions. Potential launch related noise issues consist of worker related and community annoyance. How community annoyance is determined is largely dependent on the listener s current activity, experience, and attitude toward the sound. For example, during missile launches, some individuals will go outside to observe the event and look forward to hearing the noise, while others will be annoyed by it.

Limits have been set by both DOD and OSHA to prevent damage to human hearing. Generally, noise levels above 1 dBA should not be exceeded at any time. A time-weighted limit for a 1 minute (or less) exposure is 11 dBA. In areas where these noise levels would be exceeded, personnel are required to wear hearing protection. Figures .1.1. -1 through .1.1. -3 and table .1.1. -1 provide the noise levels generated by the loudest missile launched from the various launch areas at PMRF. Launch of the missiles that generate these noise levels has been previously analyzed and determined not to have a significant impact within the PMRF region of influence. (U.S. Army Strategic Defense Command, 1 2, Feb, p. -3 Sandia National Laboratories, 1 2, Jul, p. Strategic Defense Initiative Organization, 13 , 8
1 1, Jul p.3-3). 11

4.1.1.9.1.2 Base Operations and Maintenance

Airfield operations are analyzed in the current AICU study. Because of the low number of aircraft operations on PMRF, most high noise levels are contained within the base boundary. Some of the L_{dn} dBA contours do extend into the ad acent sugar cane fields, which is considered a compatible land use in accordance with Navy AICU recommendations. PMRF aircraft operations do not affect any off-base residential areas or other sensitive receptors.



EXPLANATION

PMRF

Polihale State Park

City

dBA A-weighted Decibel
PMRF Pacific Missile Range Facility

82 dBA (,3 meters)
2 dBA (,38 meters)
11 dBA (3 meters)
1 dBA (1 meters)
Launch Site

Scale
1. 3 Kilometers
. 1.8 Miles

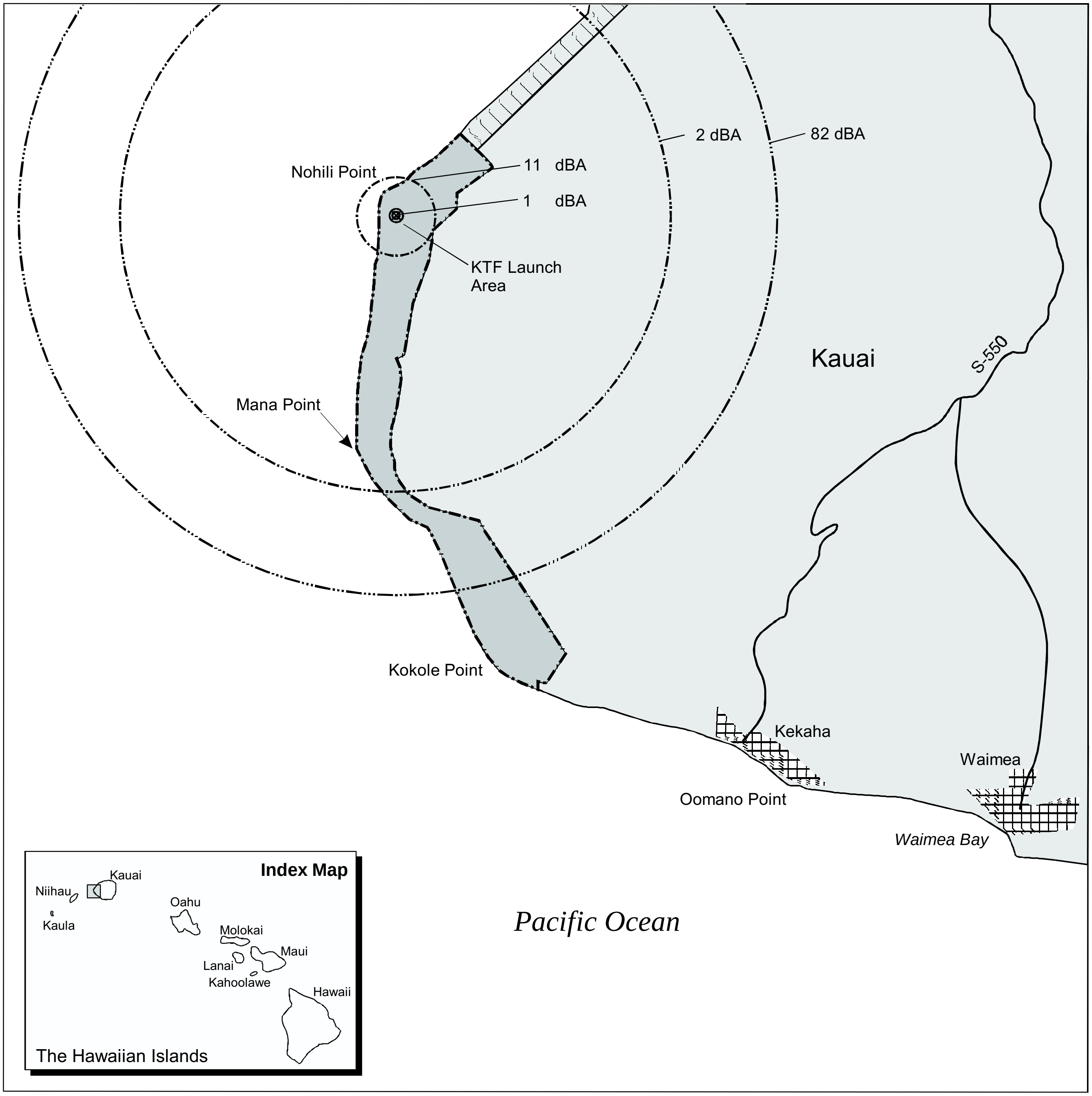
NORTH

Maximum Expected Noise Levels (dBA) for PMRF Launch Area, No-Action Alternative

Kauai, Hawaii

Figure 4.1.1.9-1

pmrf ns 1



EXPLANATION

PMRF
Polihale State Park
City

dBA A-weighted Decibel
KTF Kauai Test Facility
PMRF Pacific Missile Range Facility

82 dBA (,3 meters)
2 dBA (,38 meters)
11 dBA (3 meters)
1 dBA (1 meters)
Launch Site

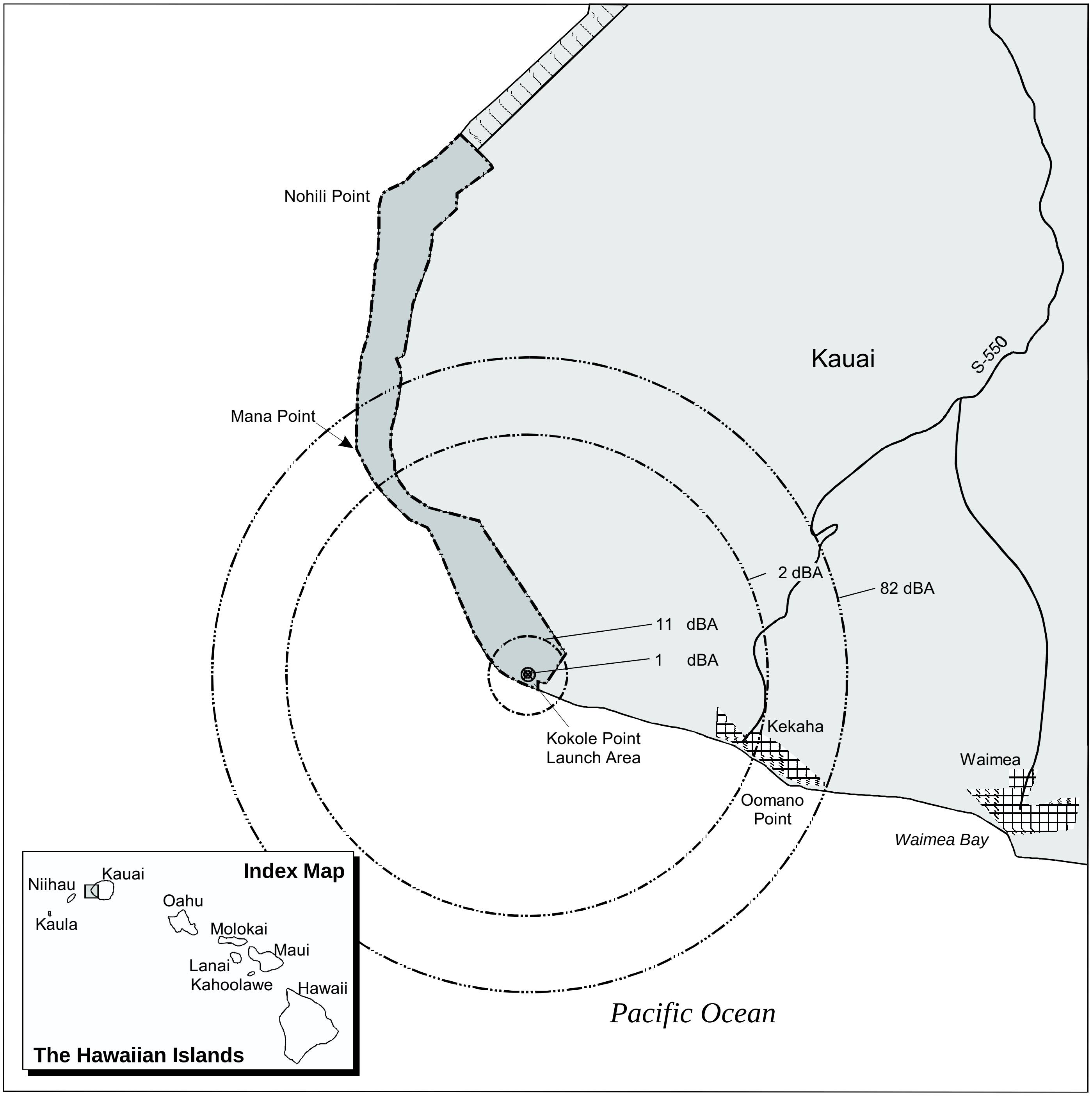
NORTH

Scale
1. 3 Kilometers
. 1.8 Miles

Maximum Expected Noise Levels (dBA) for KTF Launch Area, No-Action Alternative

Kauai, Hawaii

Figure 4.1.1.9-2



EXPLANATION

PMRF

Polihale State Park

City

dBA A-weighted Decibel
PMRF Pacific Missile Range Facility

82 dBA (,1 meters)
2 dBA (, meters)
11 dBA (3 meters)
1 dBA (meters)
Launch Site

Scale
1. 3 Kilometers
. 1.8 Miles

NORTH

Maximum Expected Noise Levels (dBA) for Kokole Point Launch Area, No-Action Alternative

Kauai, Hawaii

Figure 4.1.1.9-3

pmrf ns 3

Table 4.1.1.9-1: Representative Noise Levels from Existing Launch Areas on PMRF Under the No-action Alternative

Noise Level (dBA)	Typical Sound Thresholds	Maximum Expected Noise Level from Existing Launch Areas and Distance to Noise Levels (m/ft)		
		PMRF Launch Area (Vandal)[a]	KTF Launch Area (Talos)[a]	Kokole Point Launch Area (Terrier)[b]
Maximum Level allowed without hearing protection.	1	1/1	1/1	/1
Recommended minimum distance for all noncritical personnel. No hearing protection required for noises less than 1 minutes.	11	3/2, 2	3/2, 2	3/2, 2
Highly annoying sound level	2	,38 /1 ,	,38 /1 ,	, /1 , 3
Most residents annoyed	82	,3 /2 ,2	,3 /2 ,2	,1 /2 ,2

[a]Calculated from actual noise monitoring data for a launch.
[b]Calculated from modeling data.

On-base buildings within unacceptable noise levels have appropriate noise reduction abatement.

The last ma or source of noise at PMRF/Main Base is the use of heavy machinery or generators. Heavy machinery may include construction equipment and oversized transporters. Generators may include standard power generators and emergency generators. Each of these noise sources may generate localized high noise levels. Heavy equipment is a mobile source and will generally cause short-term elevated noise levels.

Generators are generally considered stationary. The emergency generators are normally run only 3 to hours per month to maintain their readiness in the event of an actual emergency. Noise associated with these activities does not normally affect off-base areas, and personnel on-base that work within the noise hazard areas are required to wear hearing protection.

There are no adverse impacts to the local noise environment anticipated for the No-action Alternative.

In terms of cumulative impacts, the noise environment on the Mana Plain once consisted of natural sources such as wildlife, wind, and the ocean. Through the years, the development of sugar cane, recreational opportunities (for example, four-wheel drives and motorcycles), and PMRF have changed this environment. Most noise sources on PMRF do not affect areas off-base except some aircraft operations and the occasional missile launch. Although these do contribute to cumulative noise effects, these sources are infrequent. The ma ority of the time the noise levels within the ad acent sugar cane fields andPolihale State Park are similar to natural conditions, and cumulative noise effects have not occurred.

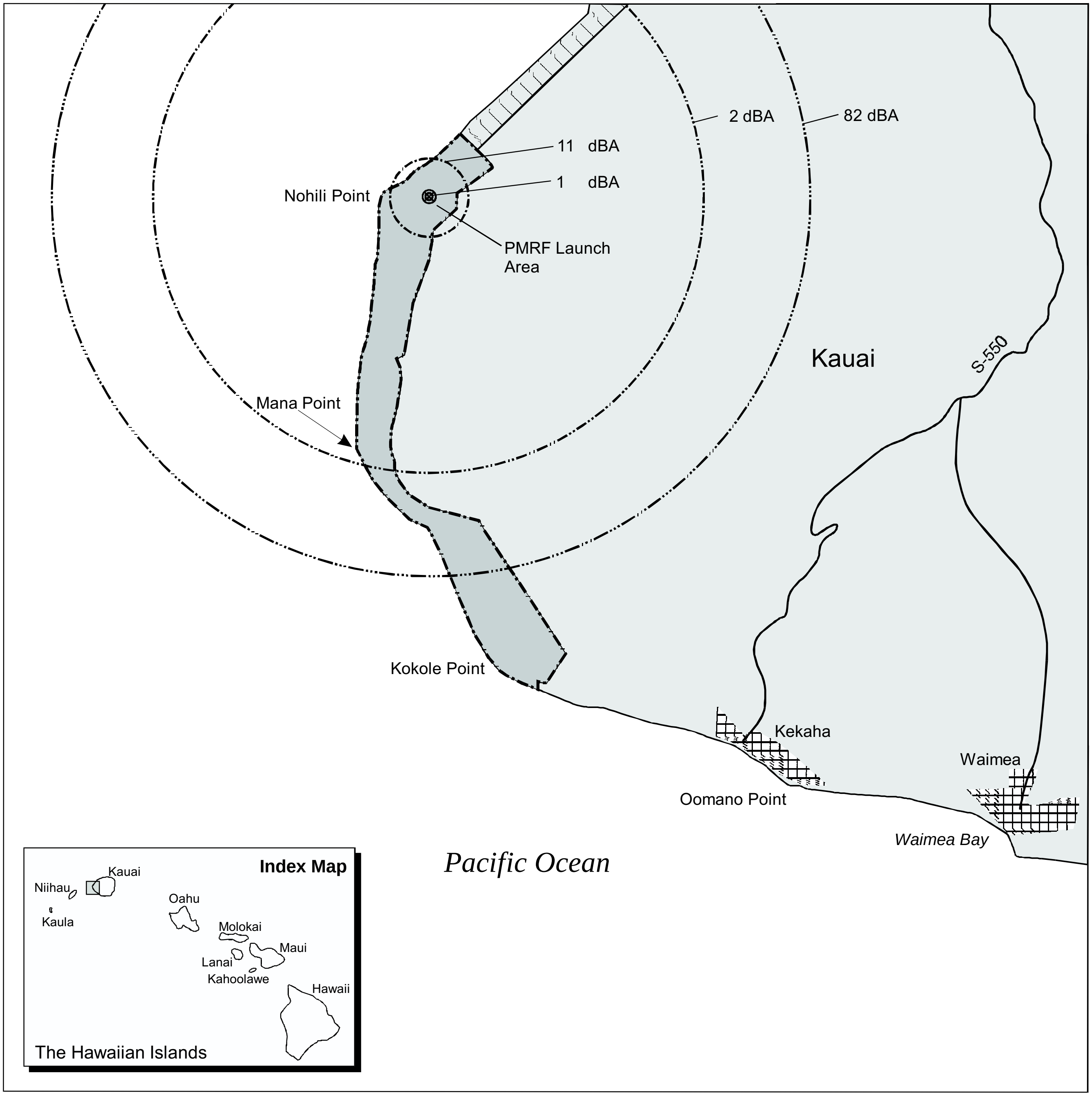
No mitigation measures for noise are proposed.

4.1.1.9.2 Proposed Action— Noise, PMRF/Main Base

Under the Proposed Action, the existing noise levels described under the No-action Alternative would continue, and those associated with TBMD and TMD testing would be added to the existing noise environment. The activities associated with the Proposed Action that would generate additional noise would consist of target missiles, defensive missiles, additional aircraft activity, and some construction. Construction would occur on PMRF and would be temporary in nature and similar to any commercial construction site. Noise generated during construction should have minimal impact on off-base areas. Under the Proposed Action, it is expected that there would be less than additional aircraft operations at PMRF, which would represent less than a 1 percent increase in total air operations and would not affect the noise levels estimated in the current PMRF AICU report.

The target and defensive missiles to be utilized under the Proposed Action would generate noise levels similar to those under the No-action Alternative. However, there would be some new launch areas that would be developed on PMRF. The Terrier is still expected to be the noisiest launch vehicle launched from southern PMRF, which has been previously analyzed not to have a significant impact to the region (Sandia National Laboratories, 1 2, Jul, p.). 8
Figures .1.1. - through .1.1. - and table .1.1. -2~~and~~ provide the noise levels generated by the loudest missile launched from the various launch areas at PMRF under the Proposed Action. None of the noise levels outside of the ground hazard area boundary for the proposed launch areas where non-essential personnel and the public are excluded would exceed either DOD or OSHA safety requirements. Personnel within the ground hazard area wear hearing protection devices. Personnel and the public outside of the ground hazard area may be startled, awakened, or distracted by the launch noise, especially those in Polihale State Park. Launches from northern PMRF should not affect the residential areas in Kekaha. Launches from the southern end of PMRF would likely annoy some of the residents of Kekaha, depending on the time of launch. However, the number of launches from southern PMRF should be similar to those described under the No-action Alternative. As in the past, it is not expected that any noise complaints would be generated by launch activities at PMRF because of the infrequent nature and short duration of the launch itself.

An important factor that determines the acoustic environment is acoustic focusing due to certain atmospheric conditions. This effect is related to the refraction of the acoustic energy as it moves through the atmosphere. Refraction occurs when meteorological conditions of temperature and winds are such that the speed of sound increases with altitude. This condition refracts the sound energy, resulting in higher noise levels at a given point than those otherwise expected. Generally only the lower atmosphere, altitudes less than , to 1 , m (1 , to 32, ft) are effective in returning sound energy to the ground. Experience shows that sound pressure levels in the far field can increase in some areas on the order of 2 dB because of atmospheric refraction effects. Acoustic focusing is not modeled in this EIS because the ever-changing meteorological conditions with respect to time and space make it virtually impossible to predict the effects of acoustic focusing without knowing the atmospheric conditions during the flight (National Aeronautics and Space Administration, 1 , Sep, p. -). 2



EXPLANATION

PMRF

Polihale State Park

City

dBA A-weighted Decibel

PMRF Pacific Missile Range Facility

82 dBA (,3 meters)

2 dBA (,38 meters)

11 bBA (3 meters)

1 dBA (1 meters)

Launch Site

Scale

1. 3 Kilometers

. 1.8 Miles

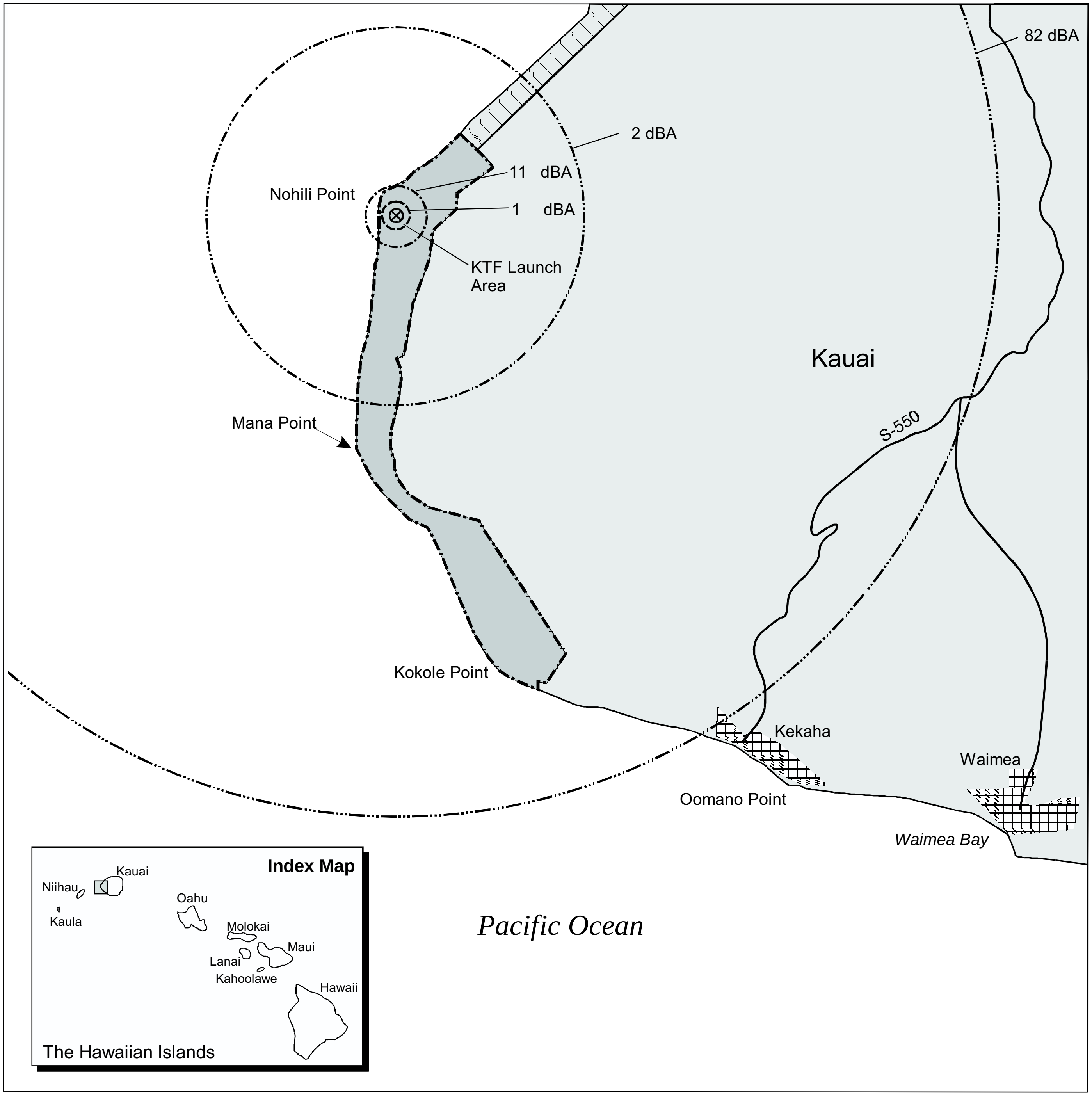
NORTH

Maximum Expected Noise Levels (dBA) for PMRF Launch Area, Potential Site

Kauai, Hawaii

Figure 4.1.1.9-4

pmrf ns



EXPLANATION

PMRF

Polihale State Park

City

dBA A-weighted Decibel
KTF Kauai Test Facility
PMRF Pacific Missile Range Facility

82 dBA (11, 8 meters)
2 dBA (3, meters)
11 dBA (meters)
1 dBA (2 1 meters)
Launch Site

NORTH

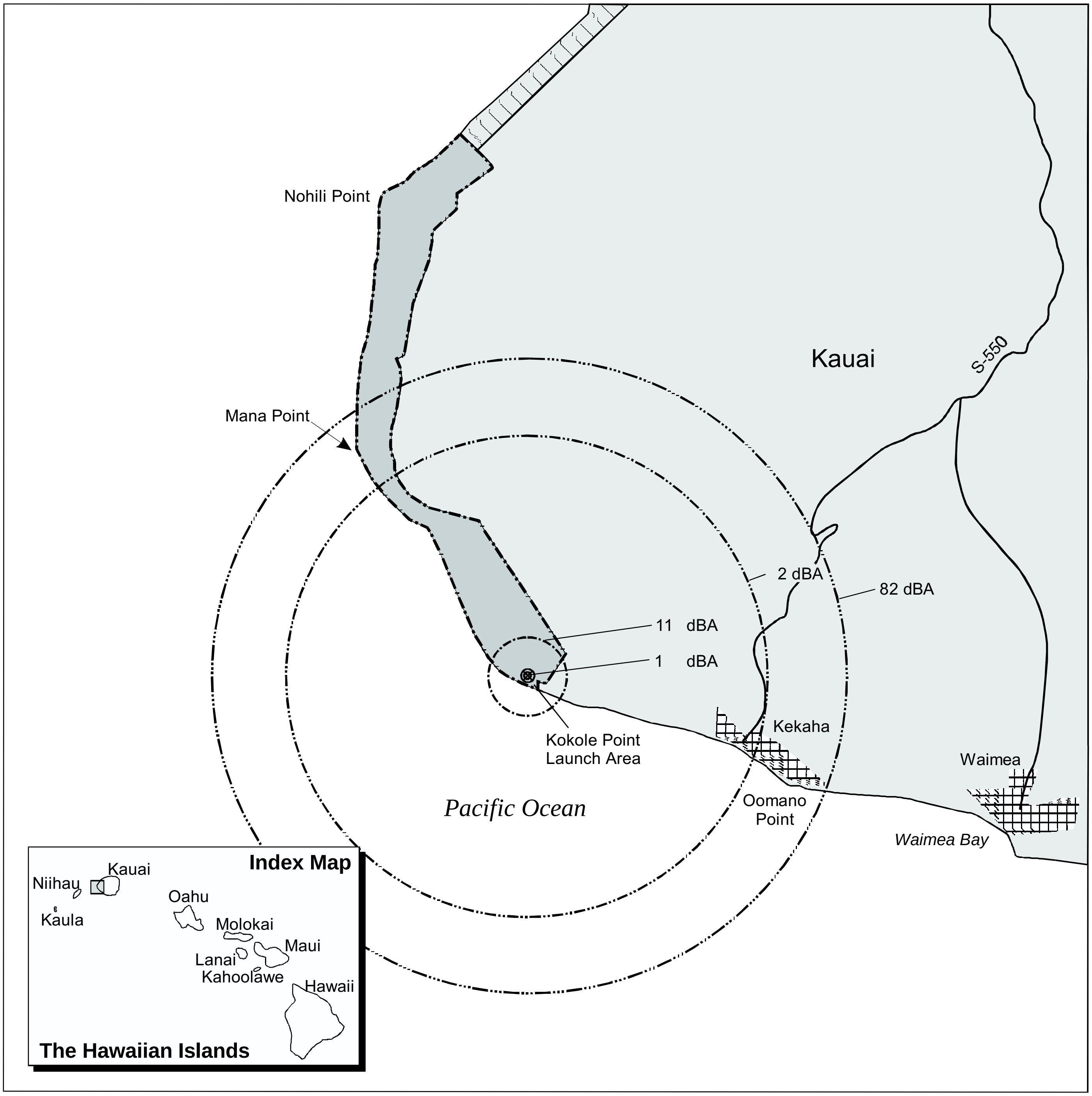
Scale
1. 3 Kilometers
. 1.8 Miles

Maximum Expected Noise Levels (dBA) for KTF Launch Area, Potential Site

Kauai, Hawaii

Figure 4.1.1.9-5

pmrf ns



EXPLANATION

PMRF

Polihale State Park

City

dBA A-weighted Decibel
PMRF Pacific Missile Range Facility

82 dBA (,1 meters)
2 dBA (, meters)
11 dBA (3 meters)
1 dBA (meters)
Launch Site

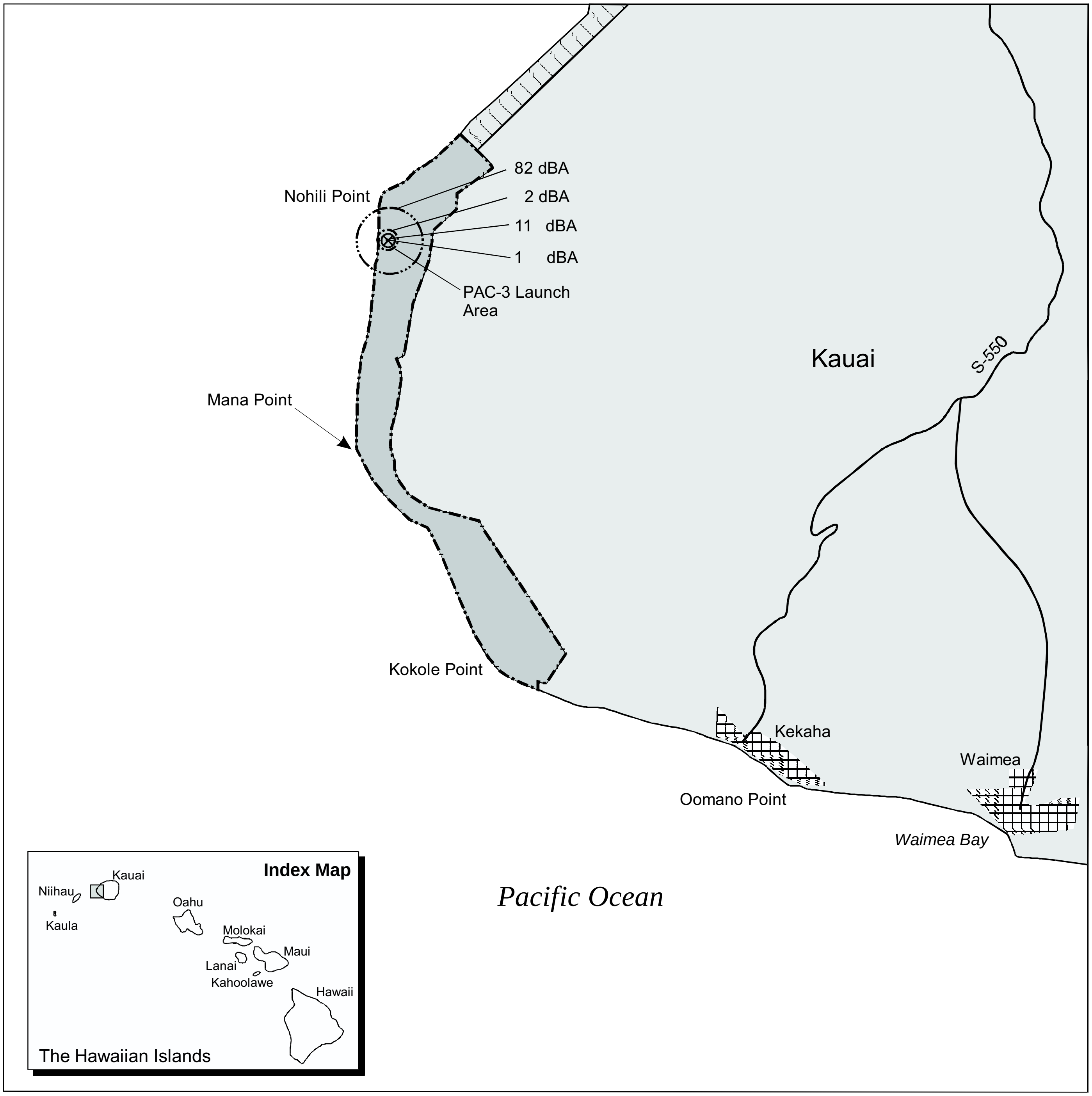
NORTH

Scale
1. 3 Kilometers
. 1.8 Miles

Maximum Expected Noise Levels (dBA) for Kokole Point Launch Area, Potential Site

Kauai, Hawaii

Figure 4.1.1.9-6



EXPLANATION

PMRF

Polihale State Park

City

dBA A-weighted Decibel
PAC-3 Patriot Advanced Capability-3
PMRF Pacific Missile Range Facility

82 dBA (3 meters)
2 dBA (2 2 meters)
11 dBA (1 meters)
1 dBA (.8 meters)
Launch Site

Scale
1. 3 Kilometers
. 1.8 Miles

NORTH

Maximum Expected Noise Levels (dBA) for PAC-3 Launch Area, Potential Site

Kauai, Hawaii

Figure 4.1.1.9-7

Table 4.1.1.9-2: Representative Noise Levels from Existing Launch Areas on PMRF Under the Proposed Action

Noise Level (dBA)	Typical Sound Thresholds	Maximum Expected Noise Level from Existing Launch Areas and Distance to Noise Levels (m/ft)			
		PMRF Launch Area (Vandal)[a]	KTF Launch Area (Lance)[b]	Kokole Launch Area (Terrier)[b]	Patriot Launch Area (PAC-3)[b]
Maximum Level allowed without hearing protection.	1	1/1	2 1/	8. /1	1/3
Recommended minimum distance for all noncritical personnel. No hearing protection required for noises less than 1 minutes.	11	3/2, 2	/1	3/2, 2	1 /
Highly annoying sound level	2	,38 /1 ,	3, /12,123	, /1 , 3	2 2/ 2
Most residents annoyed	82	,3 /2 ,2	11, 8 /38,33	,1 /2 ,2	3 /2

[a]Calculated from actual noise monitoring data for a launch.
[b]Calculated from modeling data.

Noise levels from a flight termination or explosion of the missile system would be greater than that of a normal launch however, the potential for such a mishap is low.

Sonic booms generated during launch activities would occur over the Pacific Ocean and would not affect the public on Kauai or Niihau, because the proposed missile tra ectory would not include overflight of populated areas.

As described under the No-action Alternative, the original noise environment in the region of influence has changed with the increase level of human activity in the area. The increased level of activity under the Proposed Action would increase the number of launches at PMRF. This increase would add to the cumulative noise environment however, given the temporary nature of a launch event and the infrequent number of launches, it is not expected to substantially alter the overall noise environment. The MCD-US and HLB program launches using a Strategic Target System booster would not contribute to an adverse cumulative impact to the noise environment.

No mitigation measures for noise are proposed.

4.1.1.10 Socioeconomics— PMRF/Main Base

4.1.1.10.1 No-action Alternative—Socioeconomics, PMRF/Main Base

For socioeconomics, no distinction is made between land-based training and operations, and base operations and maintenance in terms of employment income and local procurements. These are all treated collectively.

The No-action Alternative is characterized by the activities currently carried out at PMRF. These activities have a positive impact on the economy of Kauai. The Base generates 11 . million of direct expenditure in the Hawaiian Islands. A large proportion of this comprises the salaries of the PMRF staff and contractors. In 1 , salaries totaled million. The remainder includes funding for construction pro ects and other purchases in the local economy. Official visitors to PMRF in 1 were estimated to have spent .

million in the local economy. PMRF is one of Kauai s three largest employers and, as such, makes a ma or contribution to the local economy of the island.

The socioeconomic impacts of current operations at PMRF also include temporary closures to the public of parts of the western side of Kauai, including the surrounding waters. These closures would have no adverse impact on the economy of Kauai. The Land Use resource discusses the closure process in detail. There is no evidence to suggest that closure has anything other than a minimal impact on economic activity. Advance warning systems allow tourists, residents, and commercial fishermen to visit, with relative ease, alternative locations while closure takes place.

Official visitors to PMRF bring expenditures to Kauai that help support the tourist industry. The State recognizes travel and tourism as a strategic economic development and employment priority. The action, therefore, provides a positive cumulative impact, augmenting the state s efforts to fill hotels and increase visitor spending on Kauai.

No mitigation measures for socioeconomics are proposed.

4.1.1.10.2 Proposed Action—Socioeconomics, PMRF/Main Base

The analysis of the socioeconomic consequences of this action addresses the following distinct phases of activity: the No-action Alternative, site preparation activities, flight testing activities, cumulative impacts, and mitigation measures.

The analytical approach adopted for the socioeconomic resource begins by recognizing that the action can be broken down into a series of simply defined activities. Each activity has the potential to generate three broad areas of economic impact. First, general socioeconomic impacts resulting from the action can lead to an economic gain or loss for the community. Second, the action may affect the quality of life of individuals in the community by changing the social and natural environment. Third, the action may exclude or displace residents, tourists, and commercial fishermen from areas to which they have traditionally had access. This framework recognizes that tourism, the Federal Government, and agriculture are key economic sectors in Kauai.

4.1.1.10.2.1 Population and Income

The action will have little impact on the economy and population of Kauai, as the number of personnel involved in pre-launch and launch activities is limited to an average of 3 per day. This small contingent will mostly be transient, using local hotel and lodging facilities.

Preparation of the launch, instrumentation, and command facilities and the upgrading of some infrastructure at KTF will generate construction activity of relatively low intensity. It is estimated that an average of 2 personnel will be employed in the construction of new target launch locations, interceptor site, new instrumentation facilities, and in the upgrading of infrastructure. The positive impacts of this activity would include local construction employment and expenditure on raw materials. Though relatively small, this expenditure will result in a net economic gain for some individuals and the economy as a whole.

Flight test activities will increase the average number of visiting workers at PMRF from 3 per day to visitors per day. Based on this assumption, it is estimated that approximately 1 ,8 person/days of activity will be generated by the flight tests. The positive impacts of flight testing include spending in the local economy on lodging and subsistence. It is estimated that direct expenditure would amount to 2, 1,2 per year. In order to arrive at this figure it was assumed that test personnel would have a daily budget for lodging and subsistence of 18 .

4.1.1.10.2.2 Housing

The action will have minimal or no impact on the local housing market, which at present has an excess of supply. Rental housing may prove to be in shorter supply, but it has been assumed that the ma ority of visiting personnel will stay in local hotels, where the supply of rooms also exceeds demand.

4.1.1.10.2.3 Employment

The increase in activity at PMRF, though limited in scale, will increase employment opportunities and stabilize the existing PMRF workplace. Construction labor during the pre-launch phase is likely to be sourced locally. Launch personnel, by spending money in the local economy, will help protect existing obs or generate new obs. The overall impact, however, will be slight.

4.1.1.10.2.4 Agriculture

The pre-launch and launch activities would have no impact on the agricultural sector of the Kauai economy.

4.1.1.10.2.5 Tourism and Commercial Fishing

Testing would exclude some individuals and groups from the waters in the launch hazard area. Some of the activity restricted by the launch would be displaced to other locations. The Land Use resource describes the physical boundaries of the area of exclusion in detail. The economic impacts are discussed here. For the purposes of this analysis it is assumed that three main groups will be excluded from the waters surrounding KTF: residents, tourists, and commercial fishermen. Each test would exclude these potential visitors for approximately hours. There would be an average of 1 tests per year. If the ma ority of residents and visitors that use the waters within the launch hazard area do so between 1 : a.m. and : p.m., then the average access time available in a year is approximately 2,1 hours. The action, therefore, would exclude individuals for hours, or less than 3 percent of the total access time. Even in the event that none of those residents and visitors excluded from the launch hazard area are prepared to accept as a substitute other areas outside the launch hazard area, this percentage is so small as to suggest no adverse impact.

In 1 , the commercial fishing industry of Kauai landed 1 , 2 kilograms (, pounds) of fish with a value of over 1.8 million. The exclusion of fishing vessels from the waters surrounding PMRF is carefully planned, with sufficient warning and access to a hotline information system, to allow fishermen to visit alternative waters. The short periods of exclusion caused by this action, therefore, would have no adverse impact on the commercial fishing industry.

In terms of cumulative impacts, it is possible that the exclusion of commercial fishing vessels from the waters around PMRF could add to seasonal and permanent dislocation of the commercial fishing industry, caused by dwindling fishing stocks. The counter-argument, however, states that the exclusion of commercial fishing vessels would help conserve fishing stocks and lead to long-term benefits for the industry. Visitors to Kauai, as a result of this action, would help support the tourist industry which has been targeted as an economic priority.

No mitigation measures for socioeconomics are proposed.

4.1.1.11 Transportation— PMRF/Main Base

4.1.1.11.1 No-action Alternative— Transportation, PMRF/Main Base

For transportation, no distinction is made between the impacts of land-based training and operations, and base operations and maintenance. These are treated collectively below.

The No-action Alternative would consist of a continuation ofPMRF s primary mission, which includes training exercises, base operations and maintenance (including ongoing operation, maintenance, and upgrade of PMRF s transportation), and missile launches. These events are discrete and intermittent and have not resulted in identified impacts to transportation systems. Transportation of ordnance would continue to be conducted in accordance with DOT, DOD, and Navy safety procedures.

No cumulative impacts to the transportation system have been identified.

No mitigation measures for transportation are proposed.

4.1.1.11.2 Proposed Action— Transportation, PMRF/Main Base

Under the Proposed Action there would be an average of additional daily trips to PMRF. This traffic increase would be small and would represent only a 1. percent increase in the average daily traffic. The program would use existing transportation facilities, and additional road construction is not expected. No adverse impacts are expected as a result of the proposed activities.

No cumulative impacts to transportation systems have been identified.

As a mitigation measure, PMRF could make maximum use of shared vehicle travel for pro ect personnel, as well as plan for off-peak hour travel schedules, especially for heavy vehicles.

4.1.1.12 Utilities— PMRF/Main Base

4.1.1.12.1 No-action Alternative— Utilities, PMRF/Main Base

For utilities, no distinction is made between the impacts of land-based training and operations, and base operations and maintenance. These are treated collectively.

The No-action Alternative would consist of a continuation ofPMRF s primary mission, which includes training exercises, base operations and maintenance (including ongoing operation, maintenance, and upgrade of PMRF s utilities), and missile launches. No additional demands would be made on utilities under the No-action Alternative. Current utilities would continue to meet demands, and no impacts are expected.

No cumulative impacts to utilities have been identified.

No mitigation measures for utilities are proposed.

4.1.1.12.2 Proposed Action— Utilities, PMRF/Main Base

An additional personnel would result in a slight increase in demand for electricity, solid waste disposal, wastewater treatment, and potable andnonpotable water. The peak demand on local utilities would occur during launch events.

4.1.1.12.2.1 Electricity

The Proposed Action activities would require 8 additional kilowatt hours of electricity per day. The generators available at PMRF are adequate to provide this increase in electricity, and no impacts are expected.

4.1.1.12.2.2 Solid Waste

The Proposed Action would result in an additional 2, 2 kilograms (2 tons) of solid waste per year, a percent increase. Current life expectancy of the landfill is one more year, until the end of 1 8. The potential increase would not result in impacts since the county intends to implement plans to meet future refuse requirements.

4.1.1.12.2.3 Wastewater

The Proposed Action would result in an additional , L (1,8 gal) of wastewater per year. Since the current activities are resulting in operating at only 3 percent of the capacity of the system, no impacts are expected.

4.1.1.12.2.4 Water

The Proposed Action activities at PMRF would require an additional 1 ,1 2 L (, gal) of potable water per day. This amount, in addition to that currently used, would still be within the capacity of the current water system, and no impacts are expected.

Additional solid waste generated as a result of the Proposed Action would create a cumulative impact to the Kekaha Landfill however, this would represent only a minor increase when compared to the total amount generated on Kauai.

No mitigation measures for utilities are proposed.

4.1.1.13 Visual and Aesthetic Resources— PMRF/Main Base

The Hawaii State Plan ob ective for visual resources includes the preservation of views to enhance the visual and aesthetic en oyment of mountains, ocean, scenic landscape, and other natural features. Any change to the visual environment could affect the en oyment of the resource.

4.1.1.13.1 No-action Alternative— Visual and Aesthetic Resources, PMRF/Main Base

For visual and aesthetic resources, no distinction is made between the impacts of land-based training and operations, and base operations and maintenance. These are treated collectively.

Under the No-action Alternative, there would be no change to the visual environment at PMRF and the surrounding area. As described in the affected environment, PMRF does not obstruct any views of the cliffs or the Nohili Dunes (the most visible landscape features in the region of influence). The base has maintained the beaches on the installation in a natural setting. Under the No-action Alternative, the visual environment would continue in the setting described in the affected environment, and no adverse impacts would occur.

In terms of cumulative impacts, development of sugar cane had the greatest influence on the visual environment on the Mana Plain by changing the natural setting of the area to agricultural lands. The introduction of a military installation further changed the visual environment. The overall prominent vistas of the cliffs and Nohili Dunes have remained unobstructed except for telephone poles along State Highway   . No other pro ects for the area are planned that would change the visual environment.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.1.13.2 Proposed Action— Visual and Aesthetic Resources, PMRF/Main Base

Under the Proposed Action, PMRF would add new target and interceptor launch facilities. Most construction would require a small clear pad or a stool launch pad. The proposed areas of development would occur in the KTF area or ust south of this area on land that already contains operational facilities. Most of the areas proposed for use would consist of existing launch pads, except sites B, C, and E. The interceptor launch facilities (Site E) would consist of only a cleared pad and the target launch facilities, a stool launch pad with an environmental shelter similar to the existing Strategic Target System. These new facilities would be located near existing operational facilities and would not provide an out-of-character element. None of the new facilities would be visible to the public east of the base. A target launch pad at either site B or C may be visible to the public using the beaches on PMRF or the ocean west of the base. Since most of the existing facilities at PMRF are obstructed from view from the beach area because of vegetation, these new facilities would alter the natural visual environment along the beaches and provide an out-of-character element. However, because of the topography along the coast of PMRF, these facilities would only affect the viewshed immediately along the beach in front of the facilities. These facilities would be located along PMRF recreational areas 1 and 2, which are the least used of the PMRF recreational areas. The permanent ortemporary liquid fuel storage facilities would not be visible to the public and would not obstruct any vistas. Military vehicles, aircraft, and ships used to support TBMD and TMD would be similar to existing equipment and would not be generally visible to the public except for the occasional aircraft operation.

Overall, no adverse impacts would occur to visual resources from implementation of the Proposed Action.

In terms of cumulative impacts, as discussed under the No-action Alternative, the overall prominent vistas of the cliffs and Nohili Dunes have remained unobstructed to the public who travel to Polihale State Park east of the base. The construction of the new facilities would not affect the visual environment to the east of PMRF. However, the new facilities would be visible to beach visitors on PMRF and would provide an out-of-character element. Because these facilities would be the only visible buildings along this portion of western Kauai and would impact a very small viewshed, no cumulative impacts would occur.

To minimize the amount of visual impact from the construction of launch pads at sites B and C, PMRF could try to maintain as much natural vegetation around the launch pads as safety considerations would allow. If possible, vegetation could be maintained along the ocean side of the launch pads.

4.1.1.14 Water Resources— PMRF/Main Base

4.1.1.14.1 No-action Alternative— Water Resources, PMRF/Main Base

Under the No-action Alternative, water resources could be affected by land-based training including amphibious landings and ground maneuvers, areas that are used for handling materials in support of Fleet Operations and Base Operations and maintenance, missile launch emissions, early flight termination, and spills of toxic materials. Amphibious landings and ground maneuvers have minimal direct impact on the beach and inland areas, and surface drainage is not permanently affected. Pollution Prevention and Spill Prevention, Control, and Countermeasures Plans are followed during each exercise, reducing the potential for impacts from hazardous materials.

4.1.1.14.1.1 Land-based Training and Operations

Analysis of launch-related impacts is covered in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p. - through -). The EIS evaluated the potential 13
impacts of launch emissions, spills of toxic materials, and early flight termination. The analysis concluded that hydrogen chloride emissions would not significantly affect the chemical composition of surface or groundwater that there would be no significant increase in aluminum oxide in surface waters due to launches that sampling of surface waters in the vicinity of the launch site showed that hydrogen chloride, potentially

deposited during past launches, has not affected surface water quality on PMRF or ad acent areas that contamination from spills of toxic materials would be highly unlikely and that no significant effects on marine or fresh water due to solid fuel debris are expected. Subsequent sampling and analysis, prior to and following a 2 February 1 3 Strategic Target System target launch, showed little or no evidence that the launch produced any adverse impact on water, soil, or vegetation (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p.3 through). An assessment of lead concentration and water quality in thenearshore marine 13
environment was conducted in 1 . Lead oxide gas is one of the exhaust emissions from the Vandal missile. The results did not show an increase in lead concentrations, above the Department of Health (DOH) risk-based cleanup goal. ~~Water quality along the PMRF shoreline was within DOH standards with the exception of two locations where sugar cane irrigation water, pumped from the sugar cane fields, is discharged to the ocean (Belt CollinsHawaii, 1). In these areas, DOH water quality criteria are exceeded within m (1 ft) of the shoreline. Mixing processes are sufficient to dilute the drainage water to near background levels within to 1 m (1 to 328 ft) from the shoreline (Belt Collins Hawaii, 1 , 23 July, p.1 through 2).~~

Additional discussion regarding missile exhaust emissions and the environmental fate of solid propellant is included in section .2.1.1 .2.

4.1.1.14.1.2 Base Operations and Maintenance

Pollution Prevention, Hazardous Waste Management, and Spill Prevention, Control, and Countermeasures Plans are in place. Adherence to these plans, and any required environmental permits, will minimize any potential impacts from toxic materials.

In terms of cumulative impacts, sampling programs have indicated that no measurable changes in hydrogen chloride levels could be attributed to past launches of solid rocket motors. Sampling programs have also indicated that lead concentrations from missile launch emissions have not increased the lead levels above DOH levels. No other activities have been identified that, when combined with the No-action Alternative, would contribute to cumulative impacts to water resources.

No mitigation measures for water resources are proposed.

4.1.1.14.2 Proposed Action— Water Resources, PMRF/Main Base

For the Proposed Action, water resources could be affected in similar ways as described for the No-action Alternative. The types of activities would be similar however, in many cases the level of activity would increase. A small increase in the number of fleet missile operations, developmental and operational testing, and fleet training is expected, with no adverse impact to water resources. Increased land-based operations and training would include increased missile launches and modified/upgraded and new facility construction. The increase in missile launch activities would produce some additional exhaust emissions however, the level of impacts to water resources would not be expected to increase above those identified for the No-action Alternative.

The building modifications and new construction would follow standard methods to control erosion during construction. The topography and permeability of the soils would also limit the potential for impacts to water resources from construction activities.

Since all activities would follow Spill Prevention, Control, and Countermeasures Plans, and transportation safety measures, potential impacts to surface and groundwater resulting from accidental spills of hazardous materials would be minimized.

In terms of cumulative impacts, sampling programs have indicated that no measurable changes in hydrogen chloride levels could be attributed to past launches of solid rocket motors. Sampling programs have also indicated that lead concentrations from missile launch emissions have not increased the lead levels above DOH levels. No other activities have been identified that, when combined with the Proposed Action alternative, would contribute to cumulative impacts to water resources.

No mitigation measures for water resources are proposed.

4.1.2 RESTRICTIVE EASEMENT (GROUND HAZARD AREA)

Under the No-action Alternative, the current restrictive easement would be allowed to expire at the end of the agreement between the State of Hawaii, Amfac Sugar-Kauai, and the U.S. Government on 31 December 2   2. The impacts from ~~on~~ use of the current restrictive easement were previously addressed in the Restrictive Easement EIS, which was approved by the State of Hawaii in October 1   3. The results of the analysis concluded that there would be no significant impacts from activation of the restrictive easement. Appendix F provides the executive summary of the Final Restrictive Easement EIS.

Under the Proposed Action, the U.S. Government would ~~require~~ extend the term of the restrictive easement for the ground hazard area from 1 January 2   3 until 31 December 2 3 ~~after expiration of the current agreement on 31 December 2   2~~. The same potential issues addressed in the Final Restrictive Easement EIS are still valid, with the extension of the restrictive easement for the ground hazard area until 31 December 2 3 . These issues are summarized below. The Proposed Action would also include the same conditions as the current restrictive easement (3   closures per year), except that it would allow for launches of the target and defensive missiles described under the Proposed Action that require use of this area for a ground hazard area. Appendix C provides a copy of both the existing and the proposed ground hazard area easement extension. The potential impacts of missile launching activities that require the use of the restrictive easement for the ground hazard area on PMRF and the surrounding areas are addressed under PMRF/Main Base.

4.1.2.1 Air Quality— Restrictive Easement (Ground Hazard Area)

The air quality analytical approach involved evaluating the potential impacts of the restrictive easement on regional air quality. Miscellaneous sweep-and-search vehicles and helicopters would periodically emit combustion emissions that could affect air quality standards.

Emissions from restrictive easement support activities may slightly degrade local air quality, but impacts would be temporary and not adverse.

Under the Proposed Action, sweep-and-search activities to minimize risk to the public could occur up to 3 times per year, and helicopters would be used only if necessary. Due to the intermittent and small number of sweep-and-search occurrences, impacts are not expected to be adverse since the Proposed Action activities would not cause the National or the Hawaiian AAQS to be exceeded.

The potential for cumulative regional air quality impacts on the Mana Plain, including those associated with PMRF, are addressed under PMRF/Main Base.

No mitigation measures for air quality are proposed.

4.1.2.2 Biological Resources— Restrictive Easement (Ground Hazard Area)

The Proposed Action consists of acquiring approximately 8 ha (2,11 ac) of off-base land ad acent to the PMRF as a restrictive easement. Conditions of the restrictive easement under the Proposed Action would limit development in the area until 31 December 2 3 . The only direct mission activity that would occur over the restrictive easement area with the potential for impacts would be intermittent helicopter flights to ensure clearance prior to launches. The restrictive easement would continue to be used for agricultural and public recreational purposes. Helicopter noise could cause a startle effect on wildlife in the area, but no significant impacts are expected. The proposed restrictive easement would not cause any impacts to vegetation. The implementation of the proposed restrictive easement would not cause any impacts to the wetlands present in the region of influence, which are classified as man-made, artificial wetlands.

No adverse impacts are expected to biological resources under the Proposed Action therefore, no cumulative adverse impacts would occur.

No mitigation measures for biological resources are proposed.

4.1.2.3 Cultural Resources— Restrictive Easement (Ground Hazard Area)

Potential adverse effects to historic properties were assessed by (1) determining the areas that would be affected within the restrictive easement region of influence, (2) identifying the nature and potential significance of the resources within the restrictive easement region of influence, and (3) assessing the effects that the undertaking would have on any significant resources. Pursuant to the Section 1 of the National Historic Preservation Act, consultation with the Hawaii State Historic Preservation Officer has been conducted for the restrictive easement region of influence. (U.S. Army Strategic Defense Command, 1 2, Feb, p.3-2 through 3-3). 13
Consultation with the Hawaii SHPO would be continued for issues regarding cultural resources within the restrictive easement region of influence (see appendices K and N).

As described in section 3.1.2.3, it is evident that the entire Mana area, including the region of influence, is sensitive for prehistoric, historic, and traditional resources, including burials. Although some of these resources may eventually qualify, currently there are no known properties within the restrictive easement area that are listed or eligible for listing on the Hawaii Register or National Register.

Under the Proposed Action, the U.S. Government would renew the restrictive easement on approximately 8 hectares (2,11 acres) of land owned by the State of Hawaii and Amfac Sugar-Kauai for the protection of persons and property during missile launches conducted from the PMRF and KTF. Land uses within the region of influence would remain unchanged from current agricultural, grazing, and public recreational purposes, and no new construction is planned under the Proposed Action. With the exception of the placement of warning signs throughout the restrictive easement area, no ground-disturbing activities or other activities that could have the potential to adversely affect significant cultural resources sites or burials would take place. To ensure that there are no adverse effects on the traditional and customary rights and practices of native groups, any concerns related to program activities expressed by such groups or individuals would be addressed through consultation with the DLNR State Historic Preservation Officer, OHA, and the Hui Malama I Na Kupuna O Hawai i Nei any required mitigation measures within the restrictive easement area would be determined through that process. ~~As a result, no significant impacts to cultural resources would occur~~.

Under the Proposed Action, no impacts to cultural resources are expected from use of the restrictive easement therefore, no cumulative impacts would occur.

No mitigation measures for cultural resources are proposed.

4.1.2.4 Geology and Soils— Restrictive Easement (Ground Hazard Area)

Under the Proposed Action, no physical changes to the environment within the restrictive easement are anticipated. Continued use of the restrictive easement would limit new development, which would maintain the current physiographic conditions. No short-term or long-term impacts would occur from the Proposed Action with respect to geology and soils.

No impacts to geology and soils are expected from implementation of the Proposed Action, and no other ground disturbing activities are planned within the region of influence therefore, no cumulative impacts would occur.

No mitigation measures for geology and soils are proposed.

4.1.2.5 Hazardous Materials and Hazardous Waste— Restrictive Easement (Ground Hazard Area)

Under the Proposed Action, there are no related impacts to hazardous materials and/or waste. No known hazardous waste sites exist within the restrictive easement boundary. The area within the ground hazard area may be impacted by hazardous waste as a result of an unlikely early flight termination. Hazardous waste resulting from early flight termination would be cleared from the area in accordance with the cleanup procedures described in the Strategic Target Systems Draft and Final EISs (U.S. Army ~~Space and~~ Strategic Defense Command, 1 2, Feb, p. -3 ~~1 3, Oct, p. -12~~). These procedures include sampling of the impact area 13
and removal and handling of any contaminated soil as hazardous waste.

No impacts are expected as the result of hazardous materials or hazardous waste from implementation of the Proposed Action therefore, no cumulative impacts are expected.

No mitigation measures for hazardous materials or hazardous waste are proposed.

4.1.2.6 Health and Safety— Restrictive Easement (Ground Hazard Area)

Potential impacts to public health and safety could occur if appropriate safety measures are not taken to protect all persons, private property, and vehicles within the ground hazard area. However, under the Proposed Action, safety measures would be taken as in previous launches to ensure that the land within the ground hazard area would be clear of the public during launches from PMRF and KTF. Clearing procedures would include establishing road control points 3 hours prior to launch and clearing the area using vehicles, boats, and helicopters (if necessary). Clearing this area would ensure that no in uries would occur to the public in the unlikely event of an early flight termination.

In addition, safety procedures identified in the Strategic Target System Draft EIS (U.S. Army
Space and Strategic Defense Command, 1   3, Oct, p. -13), such as having fire crews on 13
standby during launch, would be implemented. Overall, no public health and safety risks would occur.

No cumulative impacts would occur from activation of the restrictive easement. Potential cumulative health and safety issues from hazardous operations at PMRF are addressed under PMRF/Main Base.

No mitigation measures for health and safety are proposed.

4.1.2.7 Land Use— Restrictive Easement (Ground Hazard Area)

Under the Proposed Action, the U.S. Government would sign another Memorandum of Agreement with the State of Hawaii to maintain the restrictive easement until 31 December 2 3 . The potential issues associated with land use were addressed in the Restrictive
Easement EIS (U.S. Army Space and Strategic Defense Command, 1   3, Oct, p. -1). The 13
continued use of the restrictive easement beyond 2   3 would have the same effect on land use as addressed in the 1   3 Restrictive Easement EIS. The continued use of the restrictive easement would be compatible with the Hawaii State Plan, the applicable State Functional Plans (for example, agriculture, conservation lands, and recreation), and the State and county land use designations. In addition, the use of the implementation of the restrictive easement is compatible with the undeveloped nature of the sugar cane production and recreational uses of the area. The establishment of an area ad acent to the PMRF to allow for the clearance of a ground hazard area has been found to be consistent with the Hawaii Coastal   one Management Program (U.S. Army Space and Strategic Defense Command, 1   3, Oct, p.
through 1). 13

Because no development is proposed within the restrictive easement, no special area management permit is required and the Federal government is exempt from a State of Hawaii Conservation Use District Permit.

4.1.2.7.1 Recreation

Under the Proposed Action, use of the southern end (approximately 28 ha ac) of Polihale State Park would continue to be interrupted 2 minutes prior to launch. Interruptions would occur up to 3 times per year and would include access to and from the State Park along the 8-km (-mi) dirt road that starts at Highway within the ground hazard area. This area would be reopened after launch as soon as the Range Safety Officer declares the area safe.

The State Park area within the restrictive easement boundary to be cleared during launch activities does not contain any developed campsites or picnicking areas. People within the restrictive easement boundary would be notified 3 hours prior to launch that they would need to move to the north end of the State park so that the area within the restrictive easement boundary would be clear 2 minutes prior to launch. People traveling to and from the State Park would be stopped at the control points at the restrictive easement boundary during the time the area is closed. Few impacts to recreational resources would occur because the total closure time for the southern end of the State Park would be approximately 1 hours per year (3 closures of approximately 3 minutes each), no persons within the developed camping or picnicking areas would be affected, and people entering and exiting the park would only be delayed during the short closure period. Overall, establishment of a restrictive easement is compatible with the use of the area as a State Park because it preserves the natural, scenic, historic, and wildlife value and recreational nature of the property.

In terms of cumulative impacts, under the Proposed Action, the continued use of the restrictive easement would restrict changes to the current land open nature of the agricultural and recreational land uses therefore, no cumulative land use changes would be expected. Although the Polihale State Park expansion may include areas within the restrictive easement, both the State Park expansion and the restrictive easement would maintain the current existing land uses in the area and therefore, would be compatible. No other activities in the region of influence contribute to cumulative recreational closure at Polihale State Park.

No mitigation measures for land use and recreation are proposed.

4.1.2.8 Noise— Restrictive Easement (Ground Hazard Area)

Environmental impact analysis related to noise includes the potential effects on the local human and animal populations. Miscellaneous sweep-and-search vehicles, helicopters, and Strategic Target System and Vandal launches would be periodic sources of noise.

The primary noise source from restrictive easement activities would be from the use of helicopters in sweep-and-search procedures to ensure that the ground hazard area is clear of the public prior to launch. The type of helicopters used during these activities could generate noise levels of approximately dBA at 1 2 m (ft) to 81 dBA at 1 m (2, ft). These noise levels would be intermittent and similar to other noise levels experienced in the region of influence from all-terrain vehicles at Polihale State Park and heavy trucks in the sugar cane fields. Because the noise levels from the helicopters would be intermittent and similar to other high noise levels experienced in the region, no adverse impacts to humans or wildlife would occur.

As described above, cumulative noise would be associated with sugar cane activity, recreational uses, restrictive easement clearance procedures, and the occasional missile launch from PMRF. There are no sensitive receptors located within the region of influence. Because these noise levels would be intermittent (such as, up to 3 clearance procedures per year) and of short duration, no cumulative noise impacts are expected.

No mitigation measures for noise are proposed.

4.1.2.9 Socioeconomics— Restrictive Easement (Ground Hazard Area)

Impacts to socioeconomic resources could occur if proposed activities substantially affected the socioeconomic welfare of the community or State. Ma or population changes, resulting in adverse effects to public facilities, could also be classified as an impact to socioeconomic resources. This analysis addresses the economic effects resulting from the opportunity cost associated with the limitations imposed under the proposed restrictive easement. The impact analysis specifically focuses on any potential impacts to Kauai s key economic sectors, tourism and agriculture.

Historically, the impacts of restricted use in the ground hazard area have had negligible effects on Amfac Sugar-Kauai s production because the -day advance notice allows sufficient time to plan the ma ority of work around most launch events. However, occasionally it has been necessary to evacuate workers involved in day-to-day planting, harvesting, irrigation, and weed control, resulting in lost work time (Moe, pers. com., 1 3). As launch activities generally have 1 8
not impacted sugar cane production, the restrictive easement would not be disadvantageous in lease negotiations between the State and agricultural producers.

The State s leasing of restrictive easement land to diversified producers of crops other than sugar cane would also have negligible impacts on the land s agricultural lease value. Soils in the restrictive easement area are capable of growing most ma or crops currently produced on Kauai but are not conducive to high production of pineapples (U.S. Army Space and Strategic Defense Command, 1 3, Oct, p. -1). 13

Depending upon the individual planting and harvesting requirements, the effect of the restrictive easement on diversified crops may vary. Flower and nursery and vegetable crops, for example, may be more time-sensitive to launch-related delays during harvest periods.

The State may be required to lease this State of Hawaii property to small, labor-intensive agricultural producers if a single tenant cannot be obtained. Smaller tenants, however, would not have the advantage of scheduling work outside of the ground hazard area during launch events. The small tenants also would likely be required to operate the drainage pump system to maintain agricultural production.

The restricted access to Polihale State Park required during launch activities would neither impact Kauai s tourism industry nor any park revenues associated with camping activities.

Easement restrictions preventing resort development and other building construction in the ground hazard area would support Kauai s land use plans for the area. The island s western portion has not historically been a ma or attraction for resort development because oflocational and other limitations. Ma or portions of the restrictive easement area are also flood prone but are maintained in an arable condition by the drain and pump system. The soils are not conducive to large-scale construction because of the high water table. Therefore, the restrictive easement would not be a factor in curtailing the island s resort development or future tourism growth.

The approximately 11,332-hectare (28, -acre) Amfac Sugar-Kauai generates property tax revenue to Kauai County, of which industrial property tax represents a significant portion. It is estimated that the approximate 82 -ha (2, 3 -ac) of restrictive easement agricultural land generates approximately 1 , in property tax revenue. The restrictive easement would not adversely affect Kauai County s tax revenue base.

The restrictive easement would generate revenue for the State. Because the State land within the restrictive easement area is an asset of the Ceded Land Trust, 3 percent of the revenue would be paid to the Department of Hawaiian Homelands and 2 percent to the Office of Hawaiian Affairs.

Temporary evacuation of the ground hazard area that extends over the ocean (called a surface water hazard area) ad acent to PMRF would have minimal impact on both recreational and commercial fishing activities along the shoreline and nearshore waters. Fishermen are given ample notice through the issuance of NOTMARs and have the opportunity to fish ad acent waters outside the surface water hazard area for the relatively short activation of surface water hazard area.

No socioeconomic impacts would be expected under the Proposed Action therefore, no cumulative impacts would occur.

No mitigation measures for socioeconomics are proposed.

4.1.2.10 Transportation— Restrictive Easement (Ground Hazard Area)

Activities that could affect transportation access would primarily occur during the time the restrictive easement would be cleared during launch activities at PMRF. Potential impacts could occur if the clearing activity affects established transportation routes to and from Polihale State Park.

Under the Proposed Action, access to the Polihale State Park would be temporarily denied. Clearing procedures would include establishing road control points at both the northern and southern portions of the restrictive easement ground hazard area boundary at Polihale State Park and at the intersection of Lio Road and State Highway , respectively. Road control points would be at the intersection of Kao Road (a county road) and Lower Saki Mana Road and at Saki Mana and Cane Top roads. This area would be reopened after launch as soon as the Range Safety Officer declares the area safe. Kao Road would not be closed. Because the access roads in the region of influence would be closed a total of only approximately 1 hours per year, and persons entering or exiting the area would be delayed for only a short period (approximately 3 minutes), no adverse impacts would result.

In terms of cumulative impacts, no other activities that would close access to Polihale State Park would be expected therefore, no cumulative impacts would occur.

No mitigation measures for transportation are proposed.

4.1.2.11 Utilities— Restrictive Easement (Ground Hazard Area)

The Proposed Action would require the restrictive easement until 2 3 . The only direct mission activity that would occur over the restricted easement would be intermittent helicopter flights to ensure clearance prior to missile launches, with no additional requirement of utilities.

In terms of cumulative impacts, with no impacts to utilities from the Proposed Action, the potential for cumulative impacts does not exist.

No mitigation measures for utilities are proposed.

4.1.2.12 Visual and Aesthetic Resources— Restrictive Easement (Ground Hazard Area)

Impacts to visual resources would occur if any unique or visually sensitive areas within the region of influence would be negatively affected or if a human element is introduced into a pristine area.

Under the Proposed Action, continued use of the restrictive easement would limit new development and allow the current visual character of the area to be maintained. The installation of signs advising the public of the existence of the ground hazard area would be similar to other no-trespassing signs in the cane fields and swimming hazard signs in Polihale State Park.

There would be no change in the visual environment from implementation of the restrictive easement therefore, no cumulative impacts would occur.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.2.13 Water Resources— Restrictive Easement (Ground Hazard Area)

Under the Proposed Action, no new development that would affect water resources within the restrictive easement is planned. No impacts to water resources are anticipated since the effect of continuing the restrictive easement does not involve the resource directly or indirectly.

No adverse impacts to water resources would be expected under the Proposed Action. Therefore, no cumulative impacts related to the Proposed Action would occur.

No mitigation measures for water resources are proposed.

4.1.3 MAKAHA RIDGE

4.1.3.1 Air Quality—Makaha Ridge

4.1.3.1.1 No-action Alternative— Air Quality, Makaha Ridge

Under the No-action Alternative, no portion of the Proposed Action would be implemented. Current activities would continue at pro ected levels, to include generation of power as authorized under the current non-covered source permit. As such, no pro ect-related air quality impacts would occur at Makaha Ridge.

No potential for cumulative impacts has been identified.

No mitigation measures for air quality are proposed.

4.1.3.1.2 Proposed Action— Air Quality, Makaha Ridge

The Proposed Action may require construction at Makaha Ridge. If construction does occur, it may cause temporary generation of fugitive dust and diesel exhaust emissions. Additionally, VOCs may be released from paints, solvents, or cleansers. Specific amounts of each pollutant generated depend upon the number of vehicles involved, the area disturbed, and the length of time the construction would take place. Construction impacts are not anticipated to cause air quality impacts outside the actual construction site.

In addition to construction, the Proposed Action allows for an unspecified modification to the power generation facilities at Makaha Ridge. These modifications will require the non-covered source permit to be modified or renewed. This process can take an extended period of time (
to 12 months) (Inouye, 1 , Sep). In addition, an upgrade to the power generation facilities 38
may require implementation of Maximum Applicable Control Technology (MACT) in order to further minimize emissions.

No potential for cumulative impacts to air quality has been identified.

In terms of mitigation measures, standard construction measures to reduce fugitive dust could be implemented. These measures could include periodic wetting of the disturbed soils at the construction site.

4.1.3.2 Airspace—Makaha Ridge

4.1.3.2.1 No-action Alternative— Airspace, Makaha Ridge

4.1.3.2.1.1 Controlled and Uncontrolled Airspace

The ongoing ~~continuing~~ operation of the four precision tracking radars and the one surveillance radar at Makaha Ridge, along with operation of the electronic warfare assets at Makaha Ridge, would have no impact on controlled and uncontrolled airspace.

4.1.3.2.1.2 Special Use Airspace

The ongoing ~~continuing~~ operation of the four precision tracking radars and the one surveillance radar at Makaha Ridge, along with operation of the electronic warfare assets at Makaha Ridge, would have no impact on special use airspace.

4.1.3.2.1.3 En Route Airways and Jet Routes

The ongoing, continuing operation of the four precision tracking radars and the one surveillance radar at Makaha Ridge along with operation of the electronic warfare assets at Makaha Ridge, would not require either: (1) a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure or, (2) a VFR operation to change from a regular flight course or altitude. However, the need to advise non-participating aircraft to avoid the tracking radar areas and the associated EMR emissions is a potential impact to aircraft flying in the vicinity. Operation of the tracking and acquisition radars has the potential for interference with airborne weather radar systems. However, aircraft would still be notified by issuances of NOTAMs to advise avoidance of the tracking radar area during program activities. Again, however, the tracking radar area is likely to be contained within Restricted Area R-31 1 and ~~the~~ Warning Area W-188, which are in use from : a.m. to : p.m., Monday through Friday, and continuously, respectively, and therefore the potential for adverse impacts to aeronautical operations is minimal.

4.1.3.2.1.4 Airports and Airfields

The ongoing ~~continuing~~ operation of the four precision tracking radars, and the one surveillance radar at Makaha Ridge, along with operation of the electronic warfare assets at Makaha Ridge would have no impact on airports and airfields in the region of influence. Use of the heliport at Makaha Ridge, exclusively military in nature, would similarly not be impacted.

No potential for incremental, additive cumulative impacts to airspace has been identified.

No mitigation measures for airspace are proposed.

4.1.3.2.2 Proposed Action— Airspace, Makaha Ridge

The proposed pre-test flight site modification or construction activities, the land-based operations and training, and base operations and maintenance activities at Makaha Ridge would have no impact on airspace use. Test flight operations, however, do have the potential for impacts to airspace use. These are discussed below.

4.1.3.2.2.1 Controlled and Uncontrolled Airspace

The proposed new COSIP radar and mobile COSIP radar on Makaha Ridge would have no impact on controlled and uncontrolled airspace.

4.1.3.2.2.2 Special Use Airspace

The proposed new COSIP radar and mobile COSIP radar on Makaha Ridge would have no impact on special use airspace.

4.1.3.2.2.3 En Route Airways and Jet Routes

The proposed new COSIP radar and mobile COSIP radar on Makaha Ridge would necessitate the need to advise non-participating aircraft to avoid the radar areas and the associated EMR emissions. Operation of the radars has the potential for interference with airborne weather radar systems. However, aircraft would still be notified by the issuance of NOTAMs to advise avoidance of the tracking radar area during program activities. Moreover, the tracking radar area is likely to be contained within Restricted Area R-31 1 and ~~the~~ Warning Area W-188, which are in use from : a.m. to : p.m., Monday through Friday, and continuously, respectively, and therefore the potential for adverse impacts to aeronautical operations is considered not significant.

4.1.3.2.2.4 Airports and Airfields

The proposed new COSIP radar and mobile COSIP radar on Makaha Ridge would have no impact on airports and airfields in the region of influence. Use of either the existing or relocated heliport at Makaha Ridge, exclusively military in nature, would similarly not be impacted.

No potential for incremental ~~additive~~ cumulative impacts to airspace has been identified.

No mitigation measures for airspace are proposed.

4.1.3.3 Biological Resources—Makaha Ridge

4.1.3.3.1 No-action Alternative— Biological Resources, Makaha Ridge

There have been no reports of birds being affected by EMR from the existing sensors located in the Makaha Ridge complex. No adverse impacts are expected to biological resources within or ad acent to the Makaha Ridge complex. The protection provided by the restricted access, and grassy habitat~~,~~ within Makaha Ridge is a positive impact on the small Hawaiian goose (*ne ne*) population present in the area.

No cumulative impacts to biological resources are expected from the continued use of Makaha Ridge under the No-action Alternative.

No mitigation measures for biological resources are proposed.

4.1.3.3.2 Proposed Action— Biological Resources, Makaha Ridge

Construction impacts associated with the Proposed Action will have negligible impacts on biological resources within the Makaha Ridge complex. The locations selected for construction are in already disturbed or in non-native vegetation within the complex. Impacts on biological resources associated with any incremental increase in the use of radars and other communication instrumentation will be negligible. The small population of the endangered Hawaiian goose (*ne ne*) will not be affected adversely by the activities associated with the Proposed Action.

There will be no cumulative impacts associated with the Proposed Action at Makaha Ridge.

Since expected impact levels are negligible at Makaha Ridge, no specific mitigations are suggested. However, a general mitigation that might be useful and which has been suggested for PMRF/Main Base, Kamokala Magazines could be protective shielding for any outdoor lighting.

4.1.3.4 Cultural Resources—Makaha Ridge

Previous environmental documentation for Makaha Ridge has indicated that it consists of a built environment and that no historic sites were identified in this area (U.S. Department of the Navy, 1 , Aug, p. 3 U.S. Department of the Navy, 1 3, Dec, p. -12, -12, Appendix D, p.ii, 1
p.13, Appendix I). However, the buildings and structures related to defense operations carried 1
out during the Cold War could be potentially significant, particularly if they possess unique engineering features or capabilities.

4.1.3.4.1 No-action Alternative— Cultural Resources, Makaha Ridge

No activities, other than those currently conducted at the Makaha Ridge instrumentation support site, would be implemented under the No-action Alternative therefore, no known or recorded historic resources would be impacted.

In terms of cultural resources, continual or gradual alterations and/or modifications to the existing buildings and structures on Makaha Ridge as a result of normal operations may eventually compromise the integrity of potentially significant Cold War assets at the site.

In terms of mitigation measures, since the preparation of the Cultural Resources Management Overview Survey, PMRF has also conducted a Phase I archaeological survey of the installation s previously unsurveyed areas. In addition, a historic resources survey (which includes PMRF s Cold War properties) has also been conducted (U.S. Department of the Navy, 1 , Aug p.i., p.). An ICRMP for PMRF is currently being developed (Inouye, 1 8, 28 Jan). 1

4.1.3.4.2 Proposed Action— Cultural Resources, Makaha Ridge

The Proposed Action would require the potential refurbishment or expansion of existing laboratories or buildings at Makaha Ridge including the potential construction of a new laboratory building a COSIP radar mobile COSIP radar telemetry optics and command, control, and subsystems facilities. The existing helicopter pad may be relocated. Access roads to the proposed facility enhancement sites at Makaha Ridge would be upgraded as would the existing power plant at Site E.

In terms of cumulative impacts, alterations or modifications to the existing buildings and structures on Makaha Ridge as a result of the Proposed Action could possibly compromise the integrity of potentially significant Cold War assets at the site.

Mitigation measures for the Proposed Action would be the same as those presented in the in the No-action Alternative.

4.1.3.5 Geology and Soils—Makaha Ridge

The physical structure or chemical composition of soils and underlying rock in theMakaha Ridge area could potentially be affected by construction activities. The region of influence for this resource includes the land within theMakaha Ridge complex identified for potential construction of new facilities.

4.1.3.5.1 No-action Alternative— Geology and Soils,Makaha Ridge

Under the No-action Alternative, Makaha Ridge would continue to conduct minor base maintenance activities, which may include some base improvement construction pro ects (e.g., trenching for infrastructure improvements, etc.). These pro ects would result in minor ground disturbing activities which have the potential to disturb soils and cause minor erosion. However, these construction pro ects are temporary and the base implements best management practices to reduce soil erosion.

No other activities that would result in cumulative impacts to geology and soils have been identified.

No mitigation measures for geology an soils are proposed.

4.1.3.5.2 Proposed Action— Geology and Soils,Makaha Ridge

The Proposed Action includes new construction of a COSIP radar, helicopter pad (relocate), telemetry, optics, command and control, and laboratory buildings with potential upgrades to roads and existing power plants.

Minor impacts to soils are likely to occur as a result of the proposed building and road upgrades because surface slopes are generally moderate and soils may be sub ect to erosion by surface run-off. Soil disturbance will be limited to the immediate vicinity of the potential target radar/telemetry site, potential interceptor radar potential laser optics and radar building at Lucky Site radar, optics or laser additions at Clutter site and potential missile precision instrumentation radar site, satellite antenna and/or relocated helicopter pad. New construction will be of short duration.

The base will use best management practices to reduce the potential for soil erosion during construction. Various measures may be recommended to reduce water erosion of slopes, partially graded streets and pads. Alternative recommendations may include minimizing the amount of area exposed during grubbing use of soil stabilizers use of sandbags for diverting flow and creating sediment basins adding protective covering to slopes, such as mulch, straw, plastic netting, or some combination thereof and revegetating slopes and open areas as soon as possible to enhance long-term stability.

No other activities that would result in cumulative impacts to geology and soils near the proposed construction sites have been identified.

No mitigation measures for geology and soils are proposed.

4.1.3.6 Hazardous Materials and Hazardous Waste—Makaha Ridge

4.1.3.6.1 No-action Alternative— Hazardous Materials and Hazardous Wastes, Makaha Ridge

Under the No-action Alternative, Makaha Ridge would continue to use small amounts of hazardous materials and generate small amounts of hazardous waste. These materials would continue to be handled in accordance with PMRF hazardous materials and hazardous waste plans described under the affected environment. Past handling of these materials at Makaha Ridge has not resulted in any impacts to the environment around the facilities, and there are no IRP sites. No adverse impacts from the continued use of the hazardous materials used and hazardous waste generated at this facility, as described under section 3.1.3. , would occur.

In terms of cumulative impacts, the use of the PMRF pharmacy system at Makaha Ridge reduces the potential for large amounts of hazardous materials to be stored onsite. Hazardous waste generated is shipped directly from Makaha Ridge for disposal. Activities at Makaha Ridge have not resulted in any cumulative hazardous materials or hazardous waste impacts, and no other programs have been identified which could add to potential impacts.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.3.6.2 Proposed Action— Hazardous Materials and Hazardous Waste, Makaha Ridge

Under the Proposed Action, some facility construction would occur to enhance the capability of Makaha Ridge to support TBMD and TMD programs. The new facilities would include proposed radar units and instrumentation and improvements to the existing diesel generators. Construction activities would be handled under existing PMRF spill plans, and all hazardous materials and hazardous waste would be handled in accordance with State and Federal regulations.

The Proposed Action would result in some minor increases in the use of hazardous materials and generation of hazardous waste. Most of these would be associated with the new radar units, which are more efficient than past systems and require less maintenance. Overall, there would be no new types of hazardous materials used and hazardous waste generated~~,~~. ~~and~~ A~~a~~ppropriate plans are in place to handle these materials and no adverse impacts would occur. Modification to the diesel generators would result in less hazardous materials use and hazardous waste generated as the new units would be more efficient.

In terms of cumulative impacts, there would be only minor increases in the amount of hazardous materials used and hazardous waste generated, and no other programs have been identified which would result in cumulative impacts. Past activities at this site have not resulted in any hazardous materials and hazardous waste impacts.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.3.7 Health and Safety—Makaha Ridge

4.1.3.7.1 No-action Alternative— Health and Safety, Makaha Ridge

Under the No-action Alternative, hazards to health and safety could potentially occur as a result of EMR generated at Makaha Ridge. Hazards of EMR to personnel and fuel (called HERP and HERF, respectively) are the main concerns at Makaha Ridge. As described in the affected environment, no ordnance is stored at the site, so there are no HERO issues. The helicopters that use the heliport at Makaha Ridge may have EEDs however, the area is below HERO unsafe levels due to sector-blanking of the area. To ensure conditions are safe, the site is regularly surveyed for hazardous radiation, and all systems have warning lights to inform personnel when the radar units are operating. Because of Makaha Ridge s location at the end of a ridge, there are no adverse health and safety issues associated with the public. All hazardous materials used and hazardous waste generated at the site are handled according to Federal and State regulations, and operations are conducted according to OSHA guidelines.

The potential for EMR to affect aircraft operations at Makaha Ridge is addressed under Airspace.

In terms of cumulative impacts, there are no other health and safety issues within the Makaha Ridge region of influence. ~~, and P~~Personnel do not enter radar operation areas when the facilities are in use. Because personnel are outside of EMR exposure areas, no cumulative exposures would occur.

No mitigation measures for health and safety are proposed.

4.1.3.7.2 Proposed Action— Health and Safety, Makaha Ridge

Under the Proposed Action, construction of new radar and telemetry units, modifications to existing radar units, and operation of a communication laser would occur at Makaha Ridge, along with the activities described under the No-action Alternative. Potential health and safety issues would be associated with the construction of the facilities, EMR generated from the proposed new radar units, and modifications to existing units.

Construction of new facilities would be conducted in accordance with the Corps of Engineers Safety and Health Requirements Manual. Construction of new facilities is routinely accomplished for both military and civilian operations and presents only occupation-related effects on safety and health for workers involved in the performance of the construction activity. The siting of facilities would be in accordance with DOD standards, taking into account HERO, HERP, HERF, ESQD, and other facility compatibility issues.

Health and safety issues of EMR include hazards to people, to fuel, and to ordnance (HERP, HERF, and HERO, respectively). A HERP hazard is the result of tissue heating by radio frequency energy. The cornea of eyes and the testicles are particularly sensitive to such heating effects, and effects such as formation of cataracts and temporary sterilization have been documented. In addition, there is some inconclusive evidence linking long-term EMR exposure to cancer. Hazard levels are a result of radio frequency energy averaged over any - minute period.

The hazard of EMR to fuel is the ignition of fuel vapors by arcing or ignition of fuel in contact with the RF heated metal in intense radio frequency fields. The hazard of EMR on ordnance is the potential to cause the ordnance to explode in intense RF fields.

Prior to installation of any new radar or telemetry unit, the Navy conducts an EMR hazard review that considers hazards of EMR on personnel, fuel, and ordnance. The review provides recommendations for sector-blanking and safety systems to minimize HERP, HERF, and HERO exposures. The proposed systems would have the appropriate safety exclusion zones established prior to operation, and each unit would have warning lights to inform personnel when the system is emitting EMR. These systems would be located on Makaha Ridge and would not represent a public health and safety risk. The proposed systems would be similar to existing systems used at Makaha Ridge. In addition, the location of Makaha Ridge at the end of a cliff further minimizes public exposure risk to EMR.

All hazardous materials used and hazardous waste generated at the site under the Proposed Action would continue to be handled according to Federal and State regulations, and operations would be conducted according to OSHA guidelines.

The potential for EMR to affect aircraft operations at Makaha Ridge is addressed under airspace.

A tracking laser would be located at the end of Makaha Ridge to track launch systems from PMRF. Prior to installation, an independent safety analysis would be made by the Laser Safety Office of the Naval Air Warfare Center, Weapons Division, to ensure the system complies with laser safety requirements in RCC-31 - and other standards and Federal requirements. The tracking laser, which utilizes a . filter, is eye-safe and presents no public health risk from operation. The laser would be directed to the missile on PMRF to provide tracking for video equipment.

Overall, there would be no adverse health and safety risks as a result of implementation of the Proposed Action.

In terms of cumulative impacts, the addition of the radar units would be sited such that appropriate HERP distances are established and personnel do not enter these areas during radar operations. Because personnel are outside of EMR exposure areas, no cumulative exposures would occur.

No mitigation measures for health and safety are proposed.

4.1.3.8 Land Use—Makaha Ridge

4.1.3.8.1 No-action Alternative— Land Use, Makaha Ridge

4.1.3.8.1.1 Land Use

Under the No-action Alternative, Makaha Ridge would continue to be used by PMRF to support range tracking. The military uses and safety zones associated with Makaha Ridge are compatible with the existing open uses that surround the facility. The use of the facility does not conflict with the management of the Puu Ka Pele Forest Reserve. In addition, the use of Makaha Ridge is compatible with the State conservation use district which limits surrounding development. The EMR generated by the site radar units would not affect ad acent land uses.

Within the Makaha Ridge complex, the use of the proposed facilities are associated with military tracking functions and are compatible with the site. Overall, no impacts would result to land use from the No-action Alternative.

The continuation of activities at Makaha Ridge under the No-action Alternative would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. Activities at Makaha Ridge do not affect any recreational opportunities. The use of the site does not affect any historic or prehistoric resources. The site does not affect visual resources because of the isolation from public view, and current EMR generation from site radars has had negligible adverse effects on biological resources. Although EMR may exceed the site boundary, there are minimal effects to human health and safety and the environment. PMRF provides facilities that are important to the Kauai economy and is vital to the island s economic stability.

4.1.3.8.1.2 Recreation

Use of Makaha Ridge does not affect recreational activities at the Pine Forest Drive Picnic area.

In terms of cumulative impacts, the land use development that has occurred along this coastal portion of Kauai has been the Makaha Ridge site. The area surrounding this site is still open and maintained in its natural setting. Because the development of Makaha Ridge has only changed a small portion of the existing land uses, no cumulative impacts have occurred. No other development is planned for this area.

No mitigation measures for land and recreation are proposed.

4.1.3.8.2 Proposed Action— Land Use, Makaha Ridge

4.1.3.8.2.1 Land Use

Under the Proposed Action, the existing radars would continue to be used, and new radars and telemetry sites would be located on Makaha Ridge within the existing government-leased land. The new facilities would be sited in accordance with DOD and Navy safety and compatibility guidelines within the Makaha Ridge site. As described under the No-action Alternative, the surrounding uses are compatible with the Makaha Ridge site, and the additional facilities would be located within the complex and would not affect the offsite land uses. Under the Proposed Action, Makaha Ridge operations would be compatible with the surrounding land uses and zoning. The EMR generated by the proposed and existing site radar units would not affect ad acent land uses, and no impacts would occur.

The activities at Makaha Ridge under the Proposed Action would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. The potential impacts of the Proposed Action on the Hawaii Coastal one Management Program would be the same as described for the No-action Alternative, except for the potential to affect prehistoric and historic resources and biological resources from the construction and operation of new facilities. Ground disturbance for new construction would occur in previously disturbed areas and would not affect cultural or biological resources. The effects of EMR generation from new or modified radars would be similar to the No-action Alternative and would not impact biological resources. The potential for the proposed communication laser to impact biological resources would be remote. Modifications to facilities would be reviewed by PMRF and the SHPO to ensure no DOD historic structures (Cold War properties) would be adversely affected.

4.1.3.8.2.2 Recreation

Activities under the Proposed Action would not affect recreational activities at the Pine Forest Drive Picnic area.

In terms of cumulative impacts, although additional facilities would be constructed under the Proposed Action, these facilities would be located within the existing developed Makaha Ridge site and would not change any existing land uses therefore, no cumulative impacts would occur.

No mitigation measures for land use and recreation are proposed.

4.1.3.9 Noise—Makaha Ridge

4.1.3.9.1 No-action Alternative— Noise, Makaha Ridge

Current operations include intermittent use of a diesel power generator. Use of this generator may cause a short-term elevation in local noise, but this would have no adverse impact to the general noise environment.

No cumulative impacts for noise have been currently identified.

No mitigation measures for noise are proposed.

4.1.3.9.2 Proposed Action, Noise, Makaha Ridge

Potential construction may cause a temporary increase in the background noise levels. Depending upon the specific equipment used and the level of construction required, levels as high as dBA at 1 m (ft) may be experienced. However, access to the actual construction site would be limited, and the public would not be exposed to construction noise because of the site s location on an inaccessible ridge.

Other noise impacts would be similar to those described for the No-action Alternative.

No cumulative impacts for noise have been identified.

No mitigation measures for noise are proposed.

4.1.3.10 Transportation—Makaha Ridge

4.1.3.10.1 No-action Alternative— Transportation, Makaha Ridge

Under the No-action Alternative, current operations at Makaha Ridge would continue with no additional impacts to the transportation system of the area. The current personnel that use the site provide minimal effects to the local transportation system.

In terms of cumulative impacts, no other development is planned along this section of the Na Pali Coast. No cumulative impacts to transportation have been identified.

No mitigation measures for transportation are proposed.

4.1.3.10.2 Proposed Action— Transportation, Makaha Ridge

No additional traffic would be generated as a result of the Proposed Action activities except during construction. The use of construction equipment would result in some minor traffic delays traveling up the mountain. However, equipment would be kept onsite during use and would not be required to travel the road to Makaha Ridge on a daily basis. Traffic generated by the construction personnel would be temporary and would result in minor additional traffic during the morning and afternoon time periods. No impacts are anticipated from construction related traffic.

In terms of the potential for cumulative impacts, no other development is planned along this section of the Na Pali Coast. No cumulative impacts to transportation systems would occur.

No mitigation measures for transportation are proposed.

4.1.3.11 Utilities—Makaha Ridge

4.1.3.11.1 No-action Alternative— Utilities, Makaha Ridge

Under the No-action Alternative, current operations at Makaha Ridge would continue with no additional demands placed on the utility~~ies~~ systems of Makaha Ridge. Kokee Park ~~The park~~ is drilling a new well that should be on-line within 1 to 2 years. This new well will have a capacity of 1 1 L (gal) per minute (218, 3 L , gal per day) and will have a depth of . m (1 ft). The new well would minimize the ongoing impacts to water resources in the area.

No cumulative impacts to utilities systems have been identified.

No mitigation measures would be required once the new well is in place and operating at Kokee.

4.1.3.11.2 Proposed Action— Utilities, Makaha Ridge

4.1.3.11.2.1 Electricity

Electrical use at Makaha Ridge would increase by 1 percent as a result of proposed activities. Implementation of recent electrical upgrades negates the potential impacts from this increase.

4.1.3.11.2.2 Solid Waste

Proposed activities would not result in an increase in the amount of solid waste generated at Makaha Ridge.

4.1.3.11.2.3 Wastewater

Proposed activities would not result in an increase in the amount of wastewater generated at Makaha Ridge.

4.1.3.11.2.4 Water

Proposed activities would not result in an increase in the amount of water use at Makaha Ridge. However, adverse impacts to the water supply would continue until a new well is drilled.

In terms of the potential for cumulative impacts, the Proposed Action would result in a continuation of the water supply problems currently at Makaha Ridge however, the proposed new well would reduce the significance of any water demand impacts.

In terms of mitigation measures, a program similar to the mandatory water conservation program that the State Park has implemented could slightly reduce impacts.

4.1.3.12 Visual and Aesthetic Resources—Makaha Ridge

4.1.3.12.1 No-action Alternative— Visual and Aesthetic Resources, Makaha Ridge

Under the No-action Alternative, there would be no change to the visual environment on Makaha Ridge. As described in the affected environment, the site is not visible from Highway , the main public road in the area, and the facility does not obstruct any prominent vistas. The facility can be viewed by watercraft traveling the ocean approximately m (1, ft) below the facility and by hunters using the Puu Ka Pele Forest Preserve. This view of Makaha Ridge does not result in any adverse impacts.

In terms of the potential for cumulative impacts, no other development occurs along this section of the Na Pali Coast, and no other development is planned therefore, there would be no cumulative impacts to the visual environment.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.3.12.2 Proposed Action— Visual and Aesthetic Resources, Makaha Ridge

Under the Proposed Action, there is the potential for a new laboratory building, MIPIR radar, mobile imaging radar, telemetry site, and relocation of the helicopter pad. In addition, more optics and a command and control could be potentially added. The addition of these facilities at Makaha Ridge would be consistent with the already developed nature of the facility. Because public views of Makaha Ridge are limited as described under the No-action Alternative, the addition of facilities under the Proposed Action would not change the overall public visual environment, and no adverse impacts would occur.

In terms of the potential for cumulative impacts, no other development occurs along this section of the Na Pali Coast, and no other development is planned therefore, there would be no cumulative impacts to the visual environment.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.3.13 Water Resources—Makaha Ridge

This section describes the potential impacts to water resources near the boundaries of the Makaha Ridge facility that could occur from the No-action Alternative and the Proposed Action.

4.1.3.13.1 No-action Alternative— Water Resources, Makaha Ridge

Under the No-action Alternative, the impacts to water resources from ongoing tracking and surveillance and other instrumentation activities at the Makaha Ridge site are expected to be minimal.

There are no additional activities that have been identified that, when combined with the No-action Alternative, would result in cumulative impacts to water resources at the Makaha Ridge site.

No mitigation measures for water resources are proposed.

4.1.3.13.2 Proposed Action— Water Resources, Makaha Ridge

For the Proposed Action, the impacts to water resources are pro ected to be similar to the No-action Alternative. Construction of new instrumentation facilities and road upgrades would be accomplished using standard engineering techniques to control potential erosion. Surface drainages would not be modified, and no adverse impacts to groundwater would be expected.

No additional activities have been identified that, when combined with the Proposed Action, would result in cumulative impacts.

No mitigation measures for water resources are proposed.

4.1.4 KOKEE

4.1.4.1 Air Quality—Kokee

4.1.4.1.1 No-action Alternative— Air Quality, Kokee

Current operations at Kokee include the intermittent use of a generator. This generator operates under a non-covered source air permit as required by Hawaii Administrative Rules, Chapter 11- .1, Subchapter . Generator usage for the No-action Alternative conforms to this permit therefore, no adverse impacts to air quality are anticipated due to the No-action Alternative.

No cumulative impacts have currently been identified for the No-action Alternative.

No mitigation measures for air quality are proposed.

4.1.4.1.2 Proposed Action— Air Quality, Kokee

The Proposed Action requires construction at Kokee, and it may cause temporary generation of fugitive dust and diesel exhaust emissions. Additionally, VOCs may be released from painting operations or solvents or cleansers. Specific amounts of each pollutant generated depend upon the number of vehicles involved, the area disturbed, and the length of time the construction would take place.

No adverse air quality impacts are anticipated outside the actual construction site. The elevated levels of air pollutants would be temporary and would tend to dissipate rapidly at the conclusion of any active disturbance. Moreover, standard construction practices would be followed to control fugitive dust emissions.

Generator use at Kokee is currently permitted under a Non-covered Source Permit to Operate. It is anticipated that the Proposed Action would not cause generator emissions to exceed the levels established in this permit. If generator usage in support of the Proposed Action was increased, a new permit or revision to the existing permit would be obtained in accordance with Federal and state regulations.

No cumulative impacts have been identified for this portion of the Proposed Action.

In terms of mitigation measures, standard construction methods to reduce fugitive dust emissions may be implemented. This may include periodic wetting of disturbed soils.

4.1.4.2 Airspace—Kokee

4.1.4.2.1 No-action Alternative— Airspace, Kokee

4.1.4.2.1.1 Controlled and Uncontrolled Airspace

The ongoing, continuing operation of the one precision tracking radar and the HIANG air search radar at Kokee would have no impact on controlled and uncontrolled airspace.

4.1.4.2.1.2 Special Use Airspace

The ongoing, continuing operation of the one precision tracking radar and the HIANG air search radar at Kokee would have no impact on special use airspace.

4.1.4.2.1.3 Military Training Routes

There are no military training routes in the airspace use region of influence.

4.1.4.2.1.4 En Route Airways and Jet Routes

The ongoing, continuing operation of the one precision tracking radar and the HIANG air search radar at Kokee would not require either: (1) a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure or, (2) a VFR operation to change from a regular flight course or altitude. However, the need to advise non-participating aircraft to avoid the tracking radar areas and the associated EMR emissions is a potential impact to aircraft flying in the vicinity. Operation of the tracking and acquisition radars has the potential for interference with airborne weather radar systems. However, aircraft would still be notified by issuances of NOTAMs to advise avoidance of the tracking radar area during program activities. Moreover, the tracking radar area is likely to be contained within the Restricted Area R-31 1 and the Warning Area W-188 , which are in use from : a.m. to : p.m., Monday through Friday, and continuously, respectively. Therefore, no impacts to aeronautical operations are anticipated.

In addition, the Hawaiian sectional aeronautical chart includes a clear navigational warning noting that electromagnetic radiation will continuously exist within a 2-m (2, -ft) radius and 2-m (2, ft) above a unified s-band antenna near Kokee NASA Telemetry Station, Kauai. Helicopters and low speed aircraft flying within the identified airspace will be exposed to direct radiation which may produce harmful effects to personnel and equipment. Radiation is not visually apparent and must be presumed by all pilots to continuously exist. (National Ocean Service, 1 , 22 May).

4.1.4.2.1.5 Airports and Airfields

The ongoing, continuing operation of the one precision tracking radar and the HIANG air search radar at Kokee would have no impact on airports and airfields in the region of influence. Use of the heliport at Kokee would similarly not be impacted.

No potential for incremental, additive cumulative impacts to airspace has been identified.

No mitigation measures for airspace are proposed.

4.1.4.2.2 Proposed Action— Airspace, Kokee

The proposed pre-test flight site modification or construction activities, the land-based operations and training, and base operations and maintenance activities at Kokee would have no impact on airspace use. Test flight operations, however, do have the potential for impacts to airspace use. These are discussed below.

4.1.4.2.2.1 Controlled and Uncontrolled Airspace

The proposed new radars at Kokee would have no impact on controlled and uncontrolled airspace.

4.1.4.2.2.2 Special Use Airspace

The proposed new radars at Kokee would have no impact on special use airspace.

4.1.4.2.2.3 En Route Airways and Jet Routes

The proposed new radars at Kokee would necessitate advising non-participating aircraft to avoid the radar areas and the associated EMR emissions. Operation of the x-band imaging radar has the potential for interference with airborne weather radar systems. However, aircraft would still be notified by the issuance of NOTAMs to advise avoidance of the tracking radar area during program activities. Again, however, the tracking radar area is likely to be contained with Restricted Area R-31 1 and Warning Area W-188, which are in use from : a.m. to : p.m., Monday through Friday, and continuously, respectively. Therefore, the potential for adverse impacts to aeronautical operations is considered not significant.

4.1.4.2.2.4 Airports and Airfields

The proposed new radars at Kokee would have no impact on airports and airfields in the region of influence. Use of the existing heliport at Kokee would similarly not be impacted.

No potential for incremental, additive cumulative impacts to airspace has been identified.

No mitigation measures for airspace are proposed.

4.1.4.3 Biological Resources—Kokee

4.1.4.3.1 No-action Alternative— Biological Resources, Kokee

4.1.4.3.1.1 Operations

There have been no reports of birds being affected by the EMR from the existing sensors located in the Kokee complex. No adverse impacts are expected to biological resources within or ad acent to the Kokee complex.

No cumulative impacts are expected from the continued use of the Kokee complex under the No-action Alternative.

No mitigation measures for biological resources are proposed.

4.1.4.3.2 Proposed Action— Biological Resources, Kokee

Construction impacts confined within the Kokee facility complex as part of the Proposed Action would have negligible impacts on biological resources. All of the vegetation within the Kokee complex is either ruderal or horticultural landscaping.

No cumulative impacts are expected to occur to biological resources at Kokee.

No mitigation measures for biological resources are proposed.

4.1.4.4 Cultural Resources—Kokee

Previous cultural resources inventory surveys conducted for the Kokee area have indicated that it consists of a built environment and that no historic sites were identified (U.S. Department of the Navy, 1 , Aug, p. 3 U.S. Department of the Navy, 1 3, Dec, p. -18, - , -12, 1
Appendix D, p.1 , p.13, Appendix I). 1

4.1.4.4.1 No-action Alternative— Cultural Resources, Kokee

No activities other than those currently conducted at the Kokee instrumentation support site would be implemented under the No-action Alternative therefore, no known or recorded historic resources would be impacted.

In terms of cumulative impacts, continual or gradual alterations and/or modifications to the existing buildings and structures at Kokee as a result of normal operations may eventually compromise the integrity of potentially significant Cold War assets at the site.

In terms of mitigation measures, since the preparation of the Cultural Resources Management Overview Survey, PMRF has also conducted a Phase I archaeological survey of the installation s previously unsurveyed areas. In addition, a historic resources survey (which includes PMRF s Cold War properties) has also been conducted (U.S. Department of the Navy, 1 , Aug p.i., p.). An ICRMP for PMRF is currently being developed (Inouye, 1 8, 28 Jan). 1

4.1.4.4.2 Proposed Action— Cultural Resource, Kokee

At Kokee, the Proposed Action would require construction of radars, telemetry receiving antennas, and towers and/or platforms for communications equipment. Existing instrumentation may be upgraded with improved subsystems at sites A, B, and C.

Cumulative impacts to potentially significant historic resources would be the same as those for the No-action Alternative.

Mitigation measures to address impacts to potential historic resources would be the same as those for the No-action Alternative.

4.1.4.5 Geology and Soils—Kokee

The physical structure or chemical composition of soils and underlying rock in Kokee could potentially be affected by construction. The region of influence for this resource includes the land within the Kokee complex identified for potential new facility construction.

4.1.4.5.1 No-action Alternative— Geology and Soils, Kokee

Under the No-action Alternative, Kokee would continue to conduct minor maintenance activities which may include some base improvement construction pro ects (e.g., trenching for infrastructure improvements, etc.). These pro ects would result in minor ground disturbing activities which have the potential to disturb soils and cause minor erosion. However, these construction pro ects are temporary, and the base implements best management practices to reduce soil erosion.

No other activities that would result in cumulative impacts to geology and soils have been identified.

No mitigation measures for geology and soils are proposed.

4.1.4.5.2 Proposed Action— Geology and Soils, Kokee

The Proposed Action includes new construction of aradars, telemetry receiving antennas, and tower and platforms for communication equipment, with potential upgrades to various existing instrumentation.

No adverse impacts to soils are likely to occur as a result of the proposed building and road upgrades because the soils at each location have in most cases been previously disturbed and the slopes along the ridge line are relatively gentle (section 3.1. ~~1~~. .2). Soil disturbance will be limited to the immediate vicinity of a potential instrumentation and communication site, potential telemetry building and antenna, and a potential radar site. New construction will be of short duration.

The base will use best management practices to reduce the potential for soil erosion during construction.

No other activities that would result in cumulative impacts to geology and soils near the proposed construction sites have been identified.

Various measures could be employed to reduce water erosion of slopes, partially graded streets, and pads. These could include minimizing the amount of area exposed during grubbing use of soil stabilizers use of sandbags for diverting flow and creating sediment basins adding protective covering to slopes, such as mulch, straw, plastic netting, or some combination thereof and revegetating slopes and open areas as soon as possible to enhance long-term stability.

4.1.4.6 Hazardous Materials and Hazardous Waste—Kokee

This section describes the potential impacts from hazardous materials and hazardous wastes that could occur from the No-action Alternative and the Proposed Action.

4.1.4.6.1 No-action Alternative— Hazardous Material and Hazardous Waste, Kokee

Under the No-action Alternative, Kokee would continue to use small amounts of hazardous materials and generate small amounts of hazardous waste. These materials would continue to be handled in accordance with PMRF hazardous materials and hazardous waste plans described under the affected environment. Past handling of these materials at Kokee has not resulted in any impacts to the environment around the facilities, and there are no IRP sites. No adverse impacts from the continued use of the hazardous materials used and hazardous waste generated at this facility as described under section 3.1. . would occur.

In terms of cumulative impacts, the use of PMRF pharmacy system at Kokee reduces the potential for large amounts of hazardous materials to be stored onsite. In addition, hazardous waste generated at the site is shipped directly for disposal. Activities at Kokee have not resulted in any cumulative hazardous materials or hazardous waste impacts, and no other programs have been identified which could add to potential impacts.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.4.6.2 Proposed Action— Hazardous Materials and Hazardous Waste, Kokee

Under the Proposed Action, some facility construction would occur to enhance the capability of Kokee to support TBMD and TMD programs. The new facilities would include proposed radar units and instrumentation. Construction activities would be handled under existing PMRF spill plans, and all hazardous materials and hazardous waste would be handled in accordance with State and Federal regulations.

The Proposed Action would result in some minor increases in the use of hazardous materials and generation of hazardous waste. Most of these would be associated with the new radar units, which are more efficient than past systems and require less maintenance. Overall, there would be no new types of hazardous materials used and hazardous waste generated, and appropriate plans are in place to handle these materials. Overall, no adverse impacts would occur from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, there would be only minor increases in the amount of hazardous materials used and hazardous waste generated, and no other programs have been identified which would result in cumulative impacts. Past activities at this site have not resulted in any hazardous materials and hazardous waste impacts.

No mitigations measures for hazardous materials and hazardous waste are proposed.

4.1.4.7 Health and Safety—Kokee

4.1.4.7.1 No-action Alternative— Health and Safety, Kokee

Under the No-action Alternative, hazards to health and safety potentially occur as a result of EMR generated at the site. Hazards of EMR to personnel and fuel (called HERP and HERF, respectively) are the main concerns at Kokee. No ordnance is stored at the site, so there are no HERO issues. The only fuel stored at the site (diesel fuel for the electrical generators) is located outside of any EMR generating areas, so there are no HERF issues at the site. Appropriate sector blanking and the elevation of the radar units above the ground have eliminated any potential HERP issues at Kokee. To ensure conditions are safe, the site is regularly surveyed for radiation hazards, and all systems have warning lights to inform personnel when the radar units are operating. The public is not exposed to any unsafe EMR levels. All hazardous materials used and hazardous waste generated at the site are handled according to Federal and State regulations, and operations are conducted according to OSHA guidelines. Overall, no adverse health and safety risks would occur from implementation of the No-action Alternative.

The potential for EMR to affect aircraft operations at Kokee is addressed under Airspace.

In terms of the potential for cumulative impacts, there are no other health and safety issues within the Kokee region of influence. Personnel do not enter radar operation areas when the facilities are in use. Because personnel are outside of EMR exposure areas, no cumulative exposures would occur.

No mitigation measures for health and safety are proposed.

4.1.4.7.2 Proposed Action— Health and Safety, Kokee

Under the Proposed Action, construction of new radar and telemetry units and modifications to existing radar units would occur at Kokee. Potential health and safety issues would be associated with the construction of the facilities and the EMR generated from the proposed radar units and modifications to existing units.

Construction of new facilities would be conducted in accordance with Corps of Engineers Safety and Health Requirements Manual. Construction of new facilities is routinely accomplished for both military and civilian operations and presents only occupational related effects on safety and health for workers involved in the performance of the construction activity. The siting of facilities would be in accordance with DOD standards, taking into account HERO, HERP, HERF, ESQD, and other facility compatibility issues.

Health and safety issues from EMR include hazards to people, fuel, and ordnance (HERP, HERF, and HERO, respectively). A HERP hazard is the result of tissue heating by radio frequency energy. The cornea of eyes and the testicles are particularly sensitive to such heating effects, and effects such as formation of cataracts and temporary sterilization have been documented. In addition, there is some inconclusive evidence linking long-term EMR exposure to cancer. Hazard levels are a result of radio frequency energy averaged over any -minute period.

The hazard of EMR to fuel is the ignition of fuel vapors by arcing or ignition of fuel in contact with the heated metal in intense RF fields. The hazard EMR on ordnance is the potential to cause the ordnance to explode in intense RF fields.

Prior to installation of any new radar or telemetry unit, the Navy conducts an EMR hazard review that considers hazards of EMR on personnel, fuel, and ordnance. The review provides recommendations for sector blanking and safety systems to minimize HERP, HERF, and HERO exposures. The proposed systems would have the appropriate safety exclusion zones established prior to operation, and each unit would have warning lights to inform personnel when the system is emitting EMR. These systems would be located on PMRF Kokee and would not represent a public health and safety risk. The proposed systems would be similar to existing systems used at PMRF Kokee.

All hazardous materials used and hazardous waste generated at the site under the Proposed Action would continue to be handled according to Federal and State regulations, and operations would be conducted according to OSHA guidelines.

The potential for EMR to affect aircraft operations at Kokee is addressed under Airspace.

Overall, no adverse health and safety risks would occur from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, the addition of the radar units would be sited such that appropriate HERP distances are established and personnel do not enter these areas during radar operations. Because personnel are outside of EMR exposure areas, no cumulative exposures would occur.

No mitigation measures for health and safety are proposed.

4.1.4.8 Land Use—Kokee

4.1.4.8.1 No-action Alternative— Land Use, Kokee

Under the No-action Alternative, Kokee would continue to be used by PMRF to support range tracking. The military uses and safety zones associated with Kokee are compatible with the existing open uses that surround the facility. The use of the facility does not conflict with the management of the State Park. In addition, the use of Kokee is compatible with the State conservation use district which limits surrounding development. The EMR generated by the site radar units would not affect ad acent land uses. Within the Kokee complex the use all of the facilities are associated with military tracking functions and are compatible with the site. Overall, no adverse impacts to land use would occur.

The continuation of activities at Kokee under the No-action Alternative would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. Activities at Kokee do not affect any recreational opportunities. The use of the site does not affect any historic or prehistoric resources. The site has only minimal impacts on visual resources to the public and does not affect any prominent vistas of Waimea Canyon. Current EMR generation from site radars has had negligible adverse effects on biological resources. Although EMR may exceed the site boundary, there are minimal effects to the environment and human health and safety. PMRF provides facilities that are important to the Kauai economy and is vital to the island s economic stability.

4.1.4.8.1.1 Recreation

Use of Kokee does not affect recreational activities within the State Park where the site is located.

In terms of the potential for cumulative impacts, the land use development that has occurred within Kokee State Park has been limited to recreational facilities and the PMRF, NASA, and Air Force facilities. These developments make up less than 1 percent of the development that has occurred within the central portion of Kauai and have not resulted in a cumulative change to land use. No other development is planned for this area under the No-action Alternative.

No mitigation measures for land use and recreation are proposed.

4.1.4.8.2 Proposed Action— Land Use, Kokee

4.1.4.8.2.1 Land Use

Under the Proposed Action, the existing radars would continue to be used, and new radars and telemetry sites would be located at Kokee within the existing government leased land. The new facilities would be sited in accordance with DOD and Navy safety and compatibility guidelines within the site. As described under the No-action Alternative, the surrounding uses are compatible with the Kokee site, the additional facilities would be located within the complex and would not affect the offsite land uses. Under the Proposed Action, operations at Kokee would be compatible with the surrounding land uses and zoning. The EMR generated by the proposed and existing site radar units would not affect ad acent land uses. Overall, no adverse impacts to land use would occur from implementation of the Proposed Action.

The activities at Kokee under the Proposed Action would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. The potential impacts of the Proposed Action on the Hawaii Coastal one Management Program would be the same as described for the No-action Alternative except for the potential to affect prehistoric and historic resources and biological resources from the construction and operation of new facilities. Ground disturbance for new construction would occur in previously disturbed areas and would not affect cultural or biological resources. The effects of EMR generation from proposed radar systems would be similar to the No-action Alternative and would not impact biological resources. Modification to facilities would be reviewed by PMRF and the SHPO to ensure no DOD historic structures (Cold War properties) would be adversely affected.

4.1.4.8.2.2 Recreation

Activities under the Proposed Action would not affect recreational activities within Kokee State Park.

In terms of the potential for cumulative impacts, although additional facilities would be constructed under the Proposed Action, these facilities would be located within the existing developed Kokee site and would not change any existing land uses therefore, no cumulative impacts would occur.

No mitigation measures for land use and recreation are proposed.

4.1.4.9 Noise—Kokee

4.1.4.9.1 No-action Alternative— Noise, Kokee

The ma or noise source ~~at this site~~ other than vehicle traffic is the intermittent use of the diesel generators, which are enclosed within a building. No adverse noise impacts are anticipated due to the No-action Alternative at Kokee.

No cumulative impacts are currently identified for the No-action Alternative at Kokee.

No mitigation measures for noise are proposed.

4.1.4.9.2 Proposed Action— Noise, Kokee

Potential construction may cause a temporary increase in background noise levels. Depending upon the specific equipment used and the level of construction required, levels as high as dBA at 1 m (ft) may be experienced. However, access to the actual construction site will be limited. Noise levels the public may be exposed to would be limited to the temporary construction activities. Once construction is complete, noise levels would return to background levels. No adverse impacts are expected.

No cumulative impacts have been identified for this portion of the Proposed Action.

No mitigation measures for noise are proposed.

4.1.4.10 Transportation—Kokee

4.1.4.10.1 No-action Alternative— Transportation, Kokee

Under the No-action Alternative, current operations at Kokee would continue with no additional impacts to the transportation system of the area.

No cumulative impacts to transportation have been identified.

No mitigation measures for transportation are proposed.

4.1.4.10.2 Proposed Action— Transportation, Kokee

No additional traffic would be generated as a result of the Proposed Action activities except during construction. The use of construction equipment would result in some minor traffic delays traveling up the mountain. However, equipment would be kept onsite during use and would not be required to travel the road to Kokee on a daily basis. Traffic generated by the construction personnel would be temporary and would result in minor additional traffic during the morning and afternoon time periods. No impacts are anticipated from construction-related traffic.

Cumulative impacts to transportation as a result of construction-related traffic could occur if construction were to occur at both Makaha Ridge and Kokee at the same time. However, given the temporary nature of construction and the small labor requirements, no adverse cumulative impacts are expected.

No mitigation measures for transportation are proposed.

4.1.4.11 Utilities—Kokee

4.1.4.11.1 No-action Alternative— Utilities, Kokee

Under the No-action Alternative, current operations at Kokee would continue with no additional demands placed on the utilities systems. The park is drilling a new well that should be on-line within 1 to 2 years. This new well will have a capacity of 1 1 L (gal) per minute (218, 3 L , gal per day) and will have a depth of . m (1 ft). The new well would minimize the ongoing demands for water resources in the area.

No cumulative impacts to utilities systems have been identified.

No mitigation measures for utilities would be required once the new well is in place and operating at Kokee.

4.1.4.11.2 Proposed Action— Utilities, Kokee

4.1.4.11.2.1 Electricity

Electrical use at Kokee would increase by 2 percent as a result of the proposed installation of new radars. No impacts are expected to result from this increase.

4.1.4.11.2.2 Solid Waste

Proposed activities would not result in an increase in the amount of solid waste generated at Kokee.

4.1.4.11.2.3 Wastewater

Proposed activities would not result in an increase in the amount of wastewater generated at Kokee.

4.1.4.11.2.4 Water

Proposed activities would not result in an increase in the amount of water use at Kokee however, adverse impacts to the water supply would continue until a new well is drilled.

In terms of cumulative impacts, the Proposed Action would result in a continuation of the water supply problems currently at Kokee however, the proposed new well would reduce the significance of any water demand impacts.

No mitigation measures for utilities are proposed.

4.1.4.12 Visual and Aesthetic Resources—Kokee

4.1.4.12.1 No-action Alternative— Visual and Aesthetic Resources, Kokee

Under the No-action Alternative, there would be no change to the visual environment at Kokee. As described in the affected environment, some of the PMRF facilities are visible to the public along selected portions of the highway used to visit Waimea Canyon. However, none of the views of Waimea Canyon are obstructed by the PMRF facilities at Kokee therefore, no adverse visual impacts occur.

In terms of the potential for cumulative impacts, development of sugar cane, Federal government facilities, utility corridors, and State Park facilities have all altered the visual environment in the region. However, most of the views along the Kaumualii Highway still present a natural setting, and no views of Waimea Canyon have been obstructed. No other developments are planned that would further change the visual environment.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.4.12.2 Proposed Action— Visual and Aesthetic Resources, Kokee

Under the Proposed Action, there is the potential for new radar units, telemetry receiving antennas and building, and communication equipment. The proposed radar units would replace existing units and be of similar size and shape and would not be visible to the public using the highway through Kokee State Park. The proposed telemetry antenna and building and the communication equipment would be similar to existing equipment and would be no higher than existing facilities at the Kokee site. None of the proposed additions to the site would extend higher than the vegetation around the site, and therefore would not be visible to the public. Overall, under the Proposed Action there would be no change to the public visual environment as described under the affected environment, and no prominent vistas would be obscured therefore, no visual impacts would occur from the Proposed Action.

In terms of the potential for cumulative impacts, under the Proposed Action there would be no change to the public visual environment at the PMRF Kokee site cumulative impacts would be similar to those described for the No-action Alternative.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.4.13 Water Resources—Kokee

This section describes the potential impacts to water resources near the boundaries of the Kokee facility that could occur from the No-action Alternative and the Proposed Action.

4.1.4.13.1 No-action Alternative— Water Resources, Kokee

Impacts to water resources from ongoing radar, telemetry, and other instrumentation activities of the No-action Alternative are expected to be minimal.

In terms of the potential for cumulative impacts, there are no additional activities that have been identified that, when combined with the No-action Alternative, would result in cumulative impacts to water resources at the Kokee site.

No mitigation measures for water resources are proposed.

4.1.4.13.2 Proposed Action— Water Resources, Kokee

For the Proposed Action, the impacts to water resources are pro ected to be similar to the No-action Alternative. Construction of new instrumentation facilities would be accomplished using standard engineering techniques to control potential erosion. Surface drainages would not be modified, and no adverse impacts to groundwater would be expected.

No additional activities have been identified that, when combined with the Proposed Action, would result in cumulative impacts.

No mitigation measures for water resources are proposed.

4.1.5 KAMOKALA MAGAZINES

4.1.5.1 Air Quality—Kamokala Magazines

4.1.5.1.1 No-action Alternative— Air Quality, Kamokala Magazines

Under the No-action Alternative, activities at Kamokala Magazines would remain at the current pro ected levels. As such, no impact to air quality would be anticipated.

There are no currently identified cumulative impacts.

No mitigation measures for air quality are proposed.

4.1.5.1.2 Proposed Action— Air Quality, Kamokala Magazines

The Proposed Action provides for the expansion of Kamokala Magazines. Construction activities associated with the addition of two additional magazines would generate fugitive dust and exhaust byproducts. In addition, painting and cleaning activities may cause the release of limited amounts of VOCs. Specific potential pollutant generation levels would depend upon the number of vehicle involved, the area of ground disturbed, and the length of time the construction takes place. However, no exceedances of ambient air quality standards or health-based guidance levels are anticipated.

No cumulative impacts have been identified.

Standard mitigation of fugitive dust could include periodic wetting of the construction site to minimize dust generation.

4.1.5.2 Biological Resources—Kamokala Magazines

4.1.5.2.1 No-action Alternative— Biological Resources, Kamokala Magazines

As no new actions are planned under the No-action Alternative, no impacts to biological resources are expected from ongoing activities at the Kamokala Magazine weapons storage complex.

No cumulative impacts are expected to affect biological resources in the Kamokala Magazines area as a result of implementation of the No-action Alternative.

No mitigation measures for biological resources are proposed.

4.1.5.2.2 Proposed Action— Biological Resources, Kamokala Magazines

Construction impacts related to the Proposed Action of expanding the facilities and area used at the Kamokala Magazines location would affect the introduced and weedy kiawe/koa haole vegetation association. Because of the weedy, non-native character of the vegetation in the potentially disturbed area, impacts would be negligible. The drainage in the area is not expected to be impacted, and the wetlands associated with the drains and farm ponds along the cliff front and throughout the Mana Plain would not be impacted. The addition of a new and expanded security fence is not expected to have a significant effect on the wildlife of the area.

No cumulative impacts to significant biological resources would occur as result of the Proposed Action.

No specific mitigations for biological resources are proposed to implement the Proposed Action at Kamokala Magazines. However, if the site is to be lighted at night, shields could be installed to reduce potential effects on the Newell s shearwater. In addition, best engineering practices should be employed to minimize additional runoff into the drainage.

4.1.5.3 Cultural Resources—Kamokala Magazines

The Kamokala Magazines area has the potential to contain significant archaeological resources. Undocumented traditional Hawaiian agricultural features (alignments and possible water diversions) have been observed in the Kamokala Magazines area (U.S. Department of
the Navy, 1 , Aug, p. 3). This area is located within a zone of known pre-contact settlement. 1
It has a high potential for habitation sites and burial features as indicated by the presence of
these site types in the foothills ad acent to it (U.S. Department of the Navy, 1 , Aug, p. 3). 1
The magazines, which were constructed during World War II, may also be considered significant historic military assets, which are potentially eligible for listing in the National Register of Historic Places (Inouye, 1 8, 3 Feb). These ordnance magazines represent a distinctive type of structure associated with the overall construction of the base on Kauai during World
War II (U.S. Department of the Navy, 1 , Aug, p. 3 and 2). 1

4.1.5.3.1 No-action Alternative— Cultural Resources, Kamokala Magazines

No activities other than those currently conducted at the Kamokala Magazines area would be implemented under the No-action Alternative.

Gradual cumulative impacts to potential cultural resources in this area could result from alteration or modification of the existing magazines and from the presence of personnel through the incidental removal of cultural materials or destruction of sites.

~~In terms of mitigation measures, since the preparation of~~ In addition to the Cultural Resources Management Overview Survey, PMRF has also conducted a Phase I archaeological survey of the installation s previously unsurveyed areas. ~~In addition,~~ A~~a~~ historic resources survey (which includes PMRF s Cold War properties) has also been conducted. (U.S. Department of the Navy, 1 , Aug, p.i, p.). An ICRMP for PMRF is currently being developed (Inouye, 1 8, 1 28 Jan). Specific mitigation measures of potential impacts to cultural resources, identified historic buildings, and structures would be formulated in accordance with guidelines provided in PMRF s ICRMP (see appendices K and N)

4.1.5.3.2 Proposed Action— Cultural Resources, Kamokala Magazines

Under the Proposed Action, two new missile storage buildings would be constructed near the Kamokala Magazines allowing for long-term storage of target booster systems. The placement of the proposed missile storage buildings would require a leasing agreement with the State of Hawaii for use of State lands and an ESQD restrictive use easement. Construction-related activities in the area south of the Kamokala Magazines area could result in impacts to potential cultural resources. These impacts could result from ground disturbance and construction as well as the increased presence of personnel at the site, but are not considered adverse.

In terms of the potential for cumulative impacts, an increased presence of personnel at the site could result in the incidental removal of cultural materials or destruction of sites.

In terms of mitigation measures, a systematic survey of the area south of the Kamokala Magazines area has not yet been conducted due to current environmental constraints in that area. This locale appears to have been used as an unauthorized waste-disposal site from the 1 s to the present. A hazardous waste characterization would be necessary prior to implementing a comprehensive ground survey in this area.

Mitigation measures to address impacts to potential historic resources would be the same as those for the No-action Alternative.

4.1.5.4 Geology and Soils—Kamokala Magazines

The physical structure or chemical composition of soils and underlying rock in the Kamokala Magazines area could potentially be affected by new construction. The region of influence for this resource includes the land within the Kamokala Magazines identified for construction of two missile storage area and associated security fencing.

4.1.5.4.1 No-action Alternative— Geology and Soils, Kamokala Magazines

Under the No-action Alternative, PMRF would continue to conduct minor maintenance activities which may include some base improvement construction pro ects (e.g., trenching for infrastructure improvements, etc.). These pro ects would result in minor ground disturbing activities which has the potential to disturb soils and cause minor erosion. However, these construction pro ects are temporary, and the base implements best management practices to reduce soil erosion.

No other activities that would result in cumulative impacts to geology and soils have been identified.

No mitigation measures for geology and soils are proposed.

4.1.5.4.2 Proposed Action— Geology and Soils, Kamokala Magazines

The Proposed Action includes construction of two new missile storage buildings and a perimeter security fence within the Kamokala Magazines area.

Minor impacts to soils are likely to occur, ~~as a result of the proposed building~~ as the pad for the proposed building will be graded on previously undeveloped area. The soils are well drained, bouldery, and generally unsuitable for agricultural development. New construction would be of short duration. The base will use best management practices to reduce the potential for soil erosion during construction.

No other activities have been identified that would result in cumulative impacts to geology and soils near the proposed construction site ~~have been identified~~.

In terms of mitigation measures, various measures could be implemented to reduce water erosion of slopes, partially graded streets, and pads. These could include minimizing the amount of area exposed during grubbing, use of soil stabilizers, use of sandbags for diverting flow and creating sediment basins, adding protective covering to slopes, such as mulch, straw, plastic netting, or some combination thereof, and revegetating slopes and open areas as soon as possible to enhance long-term stability.

4.1.5.5 Hazardous Materials and Hazardous Waste—Kamokala Magazines

4.1.5.5.1 No-action Alternative— Hazardous Materials and Hazardous Waste, Kamokala Magazines

Under the No-action Alternative, there would be no change in the type of ordnance stored at the Kamokala Magazines. Storage and transportation of ordnance are conducted in accordance with established DOT, DOD, and Navy safety procedures. No hazardous materials are used at the site and no hazardous waste is generated therefore, no impacts would occur from the No-action Alternative.

In terms of the potential for cumulative impacts, no other ordnance or other type of hazardous materials would be stored or occur within the Kamokala Magazines area that would cumulatively add hazardous materials and hazardous waste impacts.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.5.5.2 Proposed Action— Hazardous Materials and Hazardous Waste, Kamokala Magazine

Under the Proposed Action, two new storage magazines would be built at the Kamokala Magazines area and there would be a continuation of storage associated with the No-action Alternative. Construction activities would be handled under existing PMRF spill plans, and all hazardous materials and hazardous waste would be handled in accordance with State and Federal regulations. Proposed construction would take place in an illegal dump site. Prior to construction, the Navy would address clean-up of the site with the State of Hawaii. All solid and hazardous waste would be removed from the site and any contamination remediated. As under the No-action Alternative, proposed use of the new storage magazines would not require the use of hazardous materials or the generation of hazardous waste, and therefore no impacts would occur. Potential safety issues are addressed below under Health and Safety.

In terms of the potential for cumulative impacts, activities at the storage magazines do not generate any hazardous waste and the hazardous materials (ordnance) are managed in accordance with appropriate Federal and State regulations. No other programs have been identified that would result in cumulative impacts.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.5.6 Health and Safety—Kamokala Magazines

4.1.5.6.1 No-action Alternative—Health and Safety, Kamokala Magazines

Under the No-action Alternative, there would be no change in the type of ordnance stored at the Kamokala Magazines and no increased safety risks. Storage and transportation of ordnance are conducted in accordance with established DOD and Navy safety procedures. The storage magazines have appropriate ESQD arcs for the amount and type of ordnance stored. The existing uses around the magazine and within the ESQD arcs are considered compatible. If a mishap should occur, the hazard associated with the explosion would be contained within the ESQD arcs. Overall, no adverse impacts would occur from the implementation of the No-action Alternative.

In terms of the potential for cumulative impacts, no other ordnance or other type of hazardous materials or operations are stored or occur within the safety areas for Kamokala Magazines that would cumulatively add to public safety risks.

No mitigation measures for health and safety are proposed.

4.1.5.6.2 Proposed Action—Health and Safety, Kamokala Magazines

Under the Proposed Action, two new storage magazines would be built at the Kamokala Magazines area, and there would be a continuation of storage associated with the No-action Alternative. The new facilities would be sited in accordance with existing DOD and Navy siting criteria for ordnance of the types and amounts anticipated for the new facilities, taking into account the existing storage area. Siting approval for the new facilities would be obtained from the DOD Explosive Safety Board. The ESQD requirements for the facilities would be a radius of approximately ~~533.4~~495 m (~~1,750~~1,625 ft) for which the Navy would obtain the appropriate lease or fee purchase and restrictive use easement agreements from the State of Hawaii. In addition, most of the new ESQD requirements for the proposed storage facilities would be contained within the ESQDs for the existing magazine area. Because the new facilities would be sited in accordance with DOD and Navy guidance for ordnance facilities, and transportation of the ordnance would be in accordance with DOT guidelines, there would only be a minimal increase in safety risks under the Proposed Action. The above requirements are identical to those requirements already in place at PMRF, where similar types of ordnance are already stored, and therefore does not present a new type of safety risk, and no adverse impacts would occur.

In terms of the potential for cumulative impacts, the addition of new storage facilities in combination with the existing ordnance facilities at Kamokala Magazines would only represent a minimal increase in safety risks. No other activities occur at the storage magazines or within the safety zones that could cumulatively add to the safety risks. In addition, no public facilities or routine activities occur within the ESQD area.

No mitigation measures for health and safety are proposed.

4.1.5.7 Land Use—Kamokala Magazines

4.1.5.7.1 No-action Alternative— Land Use, Kamokala Magazines

4.1.5.7.1.1 Land Use

Under the No-action Alternative, the use of the storage magazines would not change. The existing open and agricultural use of the ad acent land and areas within the ESQD arc are compatible uses because there is no development (figure 2.3. -3). The continued use of the storage magazines would be compatible with the Hawaii State Plan, applicable State Functional Plans (for example, agriculture and recreation), and foreseeable uses of the Hawaiian home lands. ~~The State agricultural and county open land designations are also compatible because they limit any development in the area. The ESQD arcs do not include Hawaiian H~~home lands~~.~~

The continuation of activities at Kamokala Magazines under the No-action Alternative would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. The operation of the site does not affect any recreational opportunities, historic or prehistoric resources, or biological resources. The site does not affect any prominent vistas and is isolated from public view. The requirement for safety zones around the site has limited development, which has served to protect and preserve scenic and open spaces. PMRF provides facilities that are important to the economy of Kauai ~~economy~~, and is vital to the island s economic stability.

4.1.5.7.1.2 Recreation

No developed recreational activities occur near the storage magazines therefore, no recreational opportunities are affected.

Overall, no adverse land use impacts would occur from implementation of the No-action Alternative.

In terms of the potential for cumulative impacts, the land use in the area ad acent to the storage magazines has been maintained as open and agricultural, and no other development or changes in use have occurred in the area. No cumulative impacts are expected from the No-action Alternative.

No mitigation measures for land use and recreation are proposed.

4.1.5.7.2 Proposed Action— Land Use, Kamokala Magazines

4.1.5.7.2.1 Land Use

Under the Proposed Action, two new storage facilities and associated security fencing on State of Hawaii land would be constructed in an open land use area in front of the existing magazine area. The existing open and agricultural use of the ad acent land and areas within the ESQD arc would be compatible uses because there is no development. In addition, the proposed ESQD arc for the new storage facilities would mostly fall within the existing ESQD arc for the current storage area. The State agricultural and county open land designations would also be compatible because they limit any development in the area. As part of the development of this site, the Navy would need to acquire, either by amendment of the existing State lease or fee acquisition, approximately 2 ha (ac) of State land to support the new magazines and a restrictive use easement, approximately   ha (12 ac), which would preclude the construction of inhabited structures within the ESQD arcs created by the new magazines. The restrictive use easement would be compatible with existing land use and the open and agricultural land use designations. The use of the proposed storage magazines and the associated ESQD would be compatible with the Hawaii State Plan and applicable State Functional Plans (for example, agriculture and recreation). Neither the land to be encumbered by the easement for the ESQD arc nor the land required for the new magazines would include Hawaiian home lands. ~~revise the existing lease agreement with the State of Hawaii to add approximately 2 ha (ac) of land that would include the new magazines. In addition, PMRF would require a restrictive easement for ESQD arc which preclude the construction of inhabited structures. The restrictive easement would be compatible with the open and agricultural land use designations. The revised lease would be extended, and the supporting ESQD easement established to cover a period out to 1 August 2 2 . The use of the proposed storage magazines and the associated ESQD would be compatible with the Hawaii State Plan and applicable State Functional Plans (for example, agriculture and recreation). The ESQD arc and land required for the new magazines would not include Hawaiian~~ ~~H~~h~~ome lands.~~

The activities at the storage magazines under the Proposed Action would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. The potential impacts of the Proposed Action on the Hawaii Coastal one Management Program would be the same as described for the No-action Alternative except for the potential to affect prehistoric and historic resources and biological resources from the construction and operation of new facilities. During construction, there is the potential to impact archaeological resources during ground disturbing activities. PMRF will consult with the SHPO prior to any construction to minimize impacts. No biological resources would be affected by proposed construction.

4.1.5.7.2.2 Recreation

No developed recreational activities occur near the storage magazines, and the proposed fencing would only be located ad acent to the facilities and would only minimally reduce the available hunting area within the region therefore, no recreational opportunities would be affected.

Overall, no adverse impacts would occur to land use from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, the land use in the area ad acent to the storage magazines has been maintained as open and agricultural, and no other development or changes in use have occurred in the area. The addition of the new storage magazines would result in less than a 1 percent change to the agricultural and open land uses in the region and would not result in any cumulative impacts to land use.

No mitigation measures for land use and recreation are proposed.

4.1.5.8 Transportation—Kamokala Magazines

4.1.5.8.1 No-action Alternative— Transportation, Kamokala Magazines

Activities currently performed at Kamokala Magazines would continue with no increase in the amount of traffic generated. Use of the caves to continue to store ordnance would not result in any traffic impacts.

No cumulative impacts to transportation have been identified.

No mitigation measures for transportation are proposed.

4.1.5.8.2 Proposed Action— Transportation, Kamokala Magazines

Two new storage magazines would be constructed and minor road improvements would be performed resulting in minimal impacts to the transportation system during the construction process. No impacts to transportation are expected as a result of the use of the new magazines.

No cumulative impacts to transportation resources are expected.

No mitigation measures for transportation are proposed.

4.1.5.9 Visual and Aesthetic Resources—Kamokala Magazines

4.1.5.9.1 No-action Alternative— Visual and Aesthetic Resources, Kamokala Magazines

Under the No-action Alternative, there would be no changes to the visual environment at Kamokala Magazines. As described in the affected environment, the vegetation, the distance from the main highway, and the construction of the caves into the cliffs effectively limit any public views of the storage magazines. The Kamokala Magazines do not change any prominent vistas of the area, and no impacts would occur.

In terms of the potential for cumulative impacts, the development of sugar cane on the Mana Plain has been the main factor in changing the visual environment. The development of Kamokala Magazines did not further change this environment because views of the site are limited. No other development is planned for the area under the No-action Alternative that would further change the visual environment.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.5.9.2 Proposed Action— Visual and Aesthetic Resources, Kamokala Magazines

Under the Proposed Action, two new storage magazines would be constructed at the Kamokala Magazines in an undisturbed area. The proposed storage magazines would be approximately 38.1 by 12.2 m (12 by   ft) and . m (22 ft) high. For safety reasons, the storage magazines would be covered with earth material (that is, dirt) except for the entrance door area which would face the cliffs outside of public view. In addition, the vegetation would be cleared from the facilities for security purposes. The proposed fence would be no larger than necessary to enclose the facilities.

The proposed construction area would occur away from the entrance roads to the existing storage area which ~~and~~ consists of trees and other vegetation. The facility would be effectively blocked from public view by the vegetation that lines the public roads near the proposed facilities. However, when no sugar cane is being developed along State Highway , the proposed facilities and clear area would be visible to the public from a distance. The earth material used to cover the facilities would help minimize some of the visual impact. The storage facilities and associated clear area would represent an out-of-character element against the cliffs on the eastern side of the Mana Plain. The proposed site would not obstruct any prominent vistas. Overall, no adverse visual impacts would occur from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, as described under the No-action Alternative, the development of sugar cane on the Mana Plain has been the main factor in changing the visual environment. No other facilities have been constructed that are visible to the public on the east side of State Highway . The proposed storage magazines would alter the visual environment and would add to the changes that have already occurred along the Mana Plain. However, the site would represent limited development, and no other development is planned for this area.

In terms of mitigation measures, to help minimize the visual impact of the storage facilities, some vegetation could be allowed to grow on the earth material used to cover the storage magazines. This vegetation would have to be of limited height and would have to conform to Navy and DOD security and safety requirements. Grass and other limited height vegetation are currently used on storage magazines on many DOD installations to help reduce erosion.

4.1.5.10 Water Resources—Kamokala Magazines

This section describes the potential impacts to water resources near the Kamokala Magazines that could occur from the No-action Alternative and the Proposed Action.

4.1.5.10.1 No-action Alternative— Water Resources, Kamokala Magazines

Impacts to water resources from ongoing ordnance storage at Kamokala Magazines is expected to be minimal.

There are no additional activities that have been identified that, when combined with the No-action Alternative, would result in cumulative impacts to water resources at the Kamokala Magazines site.

No mitigation measures for water resources are proposed.

4.1.5.10.2 Proposed Action— Water Resources, Kamokala Magazines

Impacts on water resources from construction of two missile storage buildings would be minimal. Standard engineering techniques would be employed to control potential surface water erosion. Surface drainage would not be modified, and adverse impacts to groundwater are not expected.

No additional activities have been identified that, when combined with the Proposed Action, would result in cumulative impacts.

No mitigation measures for water resources are proposed.

4.1.6 PORT ALLEN

4.1.6.1 Air Quality— Port Allen

4.1.6.1.1 No-action Alternative— Air Quality, Port Allen

The No-action Alternative includes potential low-level emissions due to exhaust and maintenance activities. No adverse air quality impacts are anticipated due to continued operations at established levels.

No cumulative impacts to air quality have been identified.

No mitigation measures for air quality are proposed.

4.1.6.1.2 Proposed Action— Air Quality, Port Allen

The Proposed Action includes provisions to increase activities at Port Allen. The activities at Port Allen are limited to maintenance and sea-target preparation/recovery. An increase in the level of activity here would lead to a potential increase in emissions resulting from motor exhaust and surface craft maintenance and support apparatus fugitive emissions. Due to the intermittent nature and the relatively low anticipated levels, no air quality impacts would be anticipated due to the proposed increase in activities at Port Allen.

Minimal cumulative impacts could occur if additional air pollutant emission sources also increased their activity levels. It is not anticipated that the activities at Port Allen would contribute significantly to the potential for exceedances of the NAAQS or health-based guidance levels.

No mitigation measures for air quality are proposed.

4.1.6.2 Hazardous Materials and Hazardous Waste— Port Allen

This section describes the potential impacts from hazardous materials and hazardous wastes that could occur from the No-action Alternative and the Proposed Action.

4.1.6.2.1 No-action Alternative— Hazardous Materials and Hazardous Waste, Port Allen

Under the No-action Alternative, Port Allen would continue to use small amounts of hazardous materials and generate small amounts of hazardous waste as described in section 3.1. .2. These materials would continue to be handled in accordance with PMRF hazardous materials and hazardous waste plans described under the affected environment. Past handling of these materials at Port Allen has not resulted in any impacts to the environment around the facility, and there are no IRP sites. The primary hazardous material issues at Port Allen are associated with fueling ships and targets and the handling of hazardous materials and hazardous waste as part of ship and target maintenance. Fuel for PMRF ships would continue to be provided by vendor to the PMRF fueling trucks for transfer to the ships. Fueling is a routine operation for vessels in the Port Allen area. As described in the affected environment, PMRF has procedures in place to deal with spills, including emergency spill response kits. Overall, no adverse hazardous materials or hazardous waste impacts would be expected from the continuation of PMRF activities at Port Allen.

In terms of the potential for cumulative impacts, the continuation of PMRF activities in con unction with other ongoing activities at Port Allen increases the risk of a hazardous material or hazardous waste spill. The general industrial nature of Port Allen provides the potential for a mishap due to ~~with~~ a number of hazardous materials and hazardous wastes utilizedby~~for~~ the various public and private organizations that use the area. However, the risk of a hazardous material or hazardous waste release should be no greater than that of any other port of similar size.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.6.2.2 Proposed Action— Hazardous Materials and Hazardous Waste, Port Allen

Under the Proposed Action, Port Allen would continue to be used in a similar way to the No-action Alternative. Impacts would be the same as described under the No-action Alternative.

Cumulative impacts would be as described for the No-action Alternative.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.1.6.3 Health and Safety— Port Allen

4.1.6.3.1 No-action Alternative— Health and Safety, Port Allen

Under the No-action Alternative, PMRF would continue to operate the Port Allen Facility to support range operations. The primary health and safety issues at Port Allen are associated with fueling ships, the transfer of inert torpedoes from shore to ships, and the handling of hazardous materials and hazardous waste as part of ship maintenance. Fuel for PMRF ships would continue to be provided by vendor to the two PMRF fueling trucks for transfer to the ships. Fueling is a routine operation for vessels in the Port Allen area and is a minimal risk to public health and safety. The transfer of torpedoes at Port Allen would continue to be conducted in accordance with PMRFINST 8 2 . A, *Explosive Safety Program*, which ensures that appropriate safety precautions are taken during all handling procedures. In addition, the torpedoes at Port Allen are considered inert except for the fuel used to propel the system. The torpedoes loaded at the site contain no ordnance and are fueled before delivery to Port Allen. The torpedo fuel (otto fuel) has a low volatility level and is non-explosive.

The use and generation of hazardous materials and hazardous waste from Port Allen would follow Federal and State guidelines and do not pose a safety and health risk to the public. Overall, no adverse health and safety risks would occur from the No-action Alternative.

In terms of the potential for cumulative impacts, the continuation of PMRF activities in con unction with other ongoing activities at Port Allen increases health and safety risks to the public. The general industrial nature of Port Allen provides the potential for a mishapdue to ~~with~~ a number of hazardous materials and hazardous wastes utilizedby~~for~~ the various public and private organizations that use the area. However, the health and safety risks should be no greater than those of any other port of similar size.

No mitigation measures for health and safety are proposed.

4.1.6.3.2 Proposed Action— Health and Safety, Port Allen

Under the Proposed Action, Port Allen would continue to be used in a similar way to the No-action Alternative. Impacts would be the same as described under the No-action Alternative.

Cumulative impacts would be as described for the No-action Alternative.

No mitigation measures for health and safety are proposed.

4.1.6.4 Land Use— Port Allen

4.1.6.4.1 No-action Alternative— Land Use, Port Allen

4.1.6.4.1.1 Land Use

Under the No-action Alternative, the use of Port Allen would not change. The existing industrial uses ad acent to Port Allen are compatible with the industrial nature of the site. The State urban classification and county industrial zoning are also compatible designations because they limit conflicting uses. Overall, no land use impacts occur from Port Allen operations.

The continuation of activities at Port Allen under the No-action Alternative would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. The operation of the site does not affect any recreational opportunities, historic or prehistoric resources, or biological resources. The site does not affect any prominent vistas. PMRF provides facilities that are important to the Kauai economy, and is vital to the island s economic stability.

4.1.6.4.1.2 Recreation

The harbor ad acent to Port Allen provides for recreational boating opportunities. Use of Port Allen by the Navy does not affect any recreational uses.

In terms of the potential for cumulative impacts, the development of Port Allen and the city of Hanapepe has resulted in a change in land use from open to an urban environment. No other development is planned as part of the No-action Alternative that would add to cumulative land use changes.

No mitigation measures for land use and recreation are proposed.

4.1.6.4.2 Proposed Action— Land Use, Port Allen

Under the Proposed Action, no development or changes to land use would occur. Operations at the harbor would be similar to the No-action Alternative. Potential impacts would be the same as described for the No-action Alternative.

Cumulative impacts would be the same as described for the No-action Alternative.

No mitigation measures for land use and recreation are proposed.

4.1.6.5 Noise— Port Allen

4.1.6.5.1 No-action Alternative— Noise, Port Allen

Ma or sources of noise for operations at Port Allen include limited heavy equipment and boat operations. The equipment operated is similar to that found elsewhere in the immediate Port area. As such, no adverse impacts due to the No-action Alternative are anticipated at Port Allen.

No cumulative impacts are currently identified for Port Allen.

No mitigation measures for noise are proposed.

4.1.6.5.2 Proposed Action— Noise, Port Allen

The Proposed Action would not directly impact activities at Port Allen. There are no additional noise generators proposed. As such, the impacts would be similar to those noted for the No-action Alternative.

No cumulative impacts to noise have been identified.

No mitigation measures for noise are proposed.

4.1.6.6 Transportation— Port Allen

4.1.6.6.1 No-action Alternative— Transportation, Port Allen

Activities currently performed at Port Allen would continue with no increase in the amount of traffic generated. Continued activities at Port Allen would not result in any traffic impacts.

No cumulative impacts to transportation resources are expected.

No mitigation measures for transportation are proposed.

4.1.6.6.2 Proposed Action— Transportation, Port Allen

Under the Proposed Action there would be additional marine operations at Port Allen that would require additional marine transportation infrastructure. An increase in truck traffic between Port Allen and PMRF would also be a result of the Proposed Action. These activities would result in minor increases in traffic but would not result in changes or adverse impacts to the level of service on local roads. Increased harbor traffic under the Proposed Action would not affect other ships using the harbor area.

No cumulative impacts to transportation resources are expected.

No mitigation measures for transportation are proposed.

4.1.6.7 Utilities— Port Allen

4.1.6.7.1 No-action Alternative— Utilities, Port Allen

Under the No-action Alternative, current operations at Port Allen would continue with no additional demands placed on the utilities systems and therefore, no impacts would occur.

No cumulative impacts to utilities are expected.

No mitigation measures for utilities are proposed.

4.1.6.7.2 Proposed Action— Utilities, Port Allen

Proposed Action activities would not result in an increase in the demand for utilities. Impacts would be the same as described for the No-action Alternative.

No cumulative impacts to utilities are expected.

No mitigation measures for utilities are proposed.

4.1.6.8 Visual and Aesthetic Resources—Port Allen

4.1.6.8.1 No-action Alternative—Visual and Aesthetic Resources, Port Allen

Under the No-action Alternative, there would be no changes to the visual environment at Port Allen. As described in the affected environment, Port Allen provides a visual environment of a harbor complex. PMRF facilities at Port Allen are characteristic of this environment and do not provide an out-of-character element; therefore, no impacts would occur.

In terms of the potential for cumulative impacts, extensive development of the Hanapepe Bay as a port facility has changed the visual environment from a natural setting to one of a developed harbor. No development is planned as part of the No-action Alternative that would further change the visual environment.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.6.8.2 Proposed Action—Visual and Aesthetic Resources, Port Allen

Under the Proposed Action, there would be no changes to the visual environment at Port Allen. The visual environment would be the same as described for the No-action Alternative.

Cumulative impacts would be the same as described for the No-action Alternative.

No mitigation measures for visual and aesthetic resources are proposed.

4.1.6.9 Water Resources—Port Allen

This section describes the potential impacts to water resources near the Port Allen facilities that could occur from the No-action Alternative and the Proposed Action.

4.1.6.9.1 No-action Alternative—Water Resources, Port Allen

No adverse impacts to water resources are expected from the continuation of boat operations and maintenance activities at the Port Allen facilities.

In terms of the potential for alternative impacts, there are no additional activities that have been identified that, when combined with the No-action Alternative, would result in cumulative impacts to water resources at the Port Allen facilities.

No mitigation measures for water resources are proposed.

4.1.6.9.2 Proposed Action—Water Resources, Port Allen

No additional activities, beyond those identified in the No-action Alternative, are included in the Proposed Action.

The potential for cumulative impacts is the same as for the No-action Alternative.

No mitigation measures for water resources are proposed.

4.2 SUPPORT SITES

4.2.1 NIIHAU

4.2.1.1 Air Quality—Niihau

4.2.1.1.1 No-action Alternative— Air Quality, Niihau

As noted in chapter 3, Niihau has only a few potential air pollution emissions sources. As such, the primary source of air pollution is the potential for wind-borne dust during the dry season. Due to the relatively pollutant-free environment and the local meteorological conditions, the continued intermittent operation of portable power generators in support of current PMRF operations would have little impact on air quality.

No cumulative impacts have currently been identified for the No-action Alternative at Niihau.

No mitigation measures for air quality are proposed.

4.2.1.1.2 Proposed Action-Air Quality—Niihau

Under the Proposed Action, both site preparation and launch activities would be undertaken at Niihau. Site preparation could include construction of an Aerostat station, a 1,82 -m (, -ft) airstrip, and one or two missile launch sites supporting structures containing command and control trailers. Launch activities could include launches of both area targets and interceptors.

Site preparation and construction would cause fugitive dust and exhaust emissions. Aerostat and launch site construction activities would generate less than 1,81 kg (2 tons) of Total Solid Particulate (TSP) per month. Conservatively assuming half of the TSP is PM-1 results in an estimated kg (1 ton) of PM-1 per month of construction (AP- 2).

Assuming construction of the airstrip and support structures, if any, would disturb an area of 3 .8 by 1, 81 m (1, ft by , ft), the construction activities could generate up to 1 2,38 kg (1 tons) of TSP per month. Using the same assumption of silt content, the potential PM-1 generated would be up to 8 , 1 kg (8 tons) per month (AP- 2). The lack of other local pollutant sources and the predominant weather patterns would tend to rapidly dissipate construction emissions. No impact to air quality would be anticipated outside of the immediate construction site due to site preparation and construction activities.

Launches of targets and interceptors from Niihau would result in temporary air quality impacts similar to those described for PMRF/Main Base missile activities. As presented in section .1.1.1, no exceedances of ambient air quality standards or health-based guidance levels would be anticipated due to proposed missile launches beyond the bounds of the ground hazard area.

Portable generators of various sizes could also be used to support proposed activities on Niihau. These generators would all be portable and have internal fuel tanks. Use would be intermittent, based upon the required level of activity. Prevailing weather conditions would tend to rapidly dissipate the emissions. Therefore, noexceedances of NAAQS or health-based guidance levels are anticipated due to generator usage in support of the Proposed Action on Niihau. It is anticipated that the Proposed Action would not cause generator emissions to exceed the levels currently permitted on Niihau. If generator usage in support of the Proposed Action was increased, appropriate new permits or revisions to existing permits would be obtained in accordance with Federal and State regulations.

While vehicular travel on Niihau will be minimal, additional consideration must be given to the potential for added emissions due to Niihau s overall lack of emissions sources. The following calculation was used as a method to determine potential amounts of dust generated per vehicle mile traveled (VMT):

lb dust/VMT (3.) (weight silt/12) (mean speed mph/3) (mean vehicle weight/3) · (number of wheels/) · (3 days of over . 1 inch rain)/3).

Specific data were not available to properly determine the actual values for each of the variables listed above. Therefore, the conservative values were used as bounding limitations as follows:

- Silt content can vary between approximately .8 to 8 weight percent. Calculations use the highest value, 8 percent.
- km (2 mi) per hour is the assumed mean speed over the unpaved roads. Greater speeds result in higher dust emissions.
- A -ton truck with six wheels is assumed to be the general vehicle used. Less weight and fewer wheels would result in lower emissions. Conversely, greater weight and a greater number of wheels would result in more dust.
- It is assumed that no days with more than . 2 cm (. 1 inch) of rain occur during the year.

Using these extreme values, the anticipated maximum dust generated due to use of unpaved roads would be . kg per vehicle km traveled (1. lb per VMT). While this will certainly be a new source of emissions on Niihau, standard weather patterns will tend to immediately disperse these minimal amounts.

In terms of the potential for cumulative impacts, no local activities are known to emit significant levels of air pollutants. Dust levels during the dry season may be elevated under windy conditions. Solid air pollutants, such as fugitive dust, charcoal kiln emissions, or Al_2O_3, could have a cumulative impact on air quality if emitted during periods when the PM-1 levels are already elevated from natural sources.

In terms of mitigation measures, standard construction measures to reduce fugitive dust could be implemented. These measures could include periodic wetting of the disturbed soils at the construction sites. In order to minimize the potential for cumulative impacts, monitoring of dust levels could be conducted prior to launch operations.

4.2.1.2 Airspace—Niihau

4.2.1.2.1 No-action Alternative— Airspace, Niihau

4.2.1.2.1.1 Controlled and Uncontrolled Airspace

The ongoing, continuing electronic warfare and radar operations and low-altitude helicopter terrain following activities on Niihau would have no impact on controlled and uncontrolled airspace.

4.2.1.2.1.2 Special Use Airspace

The ongoing, continuing electronic warfare and radar operations and low-altitude helicopter terrain following activities on Niihau would have no impact on special use airspace.

4.2.1.2.1.3 Military Training Routes

There are no military training routes in the airspace use region of influence.

4.2.1.2.1.4 En Route Airways and Jet Routes

The ongoing, continuing electronic warfare and radar operations and low-altitude helicopter terrain following activities on Niihau would have no impact on the V1 low altitude airways that cross the center of the island from east to west. Low-altitude IFR traffic would cross the island at up to , 8 . m (18, ft) mean sea level, well above both electronic warfare and radar electromagnetic emissions and the low-altitude terrain-hugging helicopter training exercises.

4.2.1.2.1.5 Airports and Airfields

The ongoing, continuing electronic warfare operations and radar low-altitude helicopter terrain following activities on Niihau would have no impact on airports and airfields.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.2.1.2.2 Proposed Action— Airspace, Niihau

The proposed pre-test flight site modification and construction activities, land-based operations and training, and base operations and maintenance activities on Niihau would have no impact on airspace use. Test flight operations, however, do have the potential for impacts. These are discussed below.

4.2.1.2.2.1 Controlled and Uncontrolled Airspace

The proposed test flight operations on Niihau would have no impact on controlled and uncontrolled airspace in the region of influence. Implementation of the stationary ALTRV for airspace utilization would provide for separation between IFR traffic and the missile launches. However, creation and activation of the proposed . -km (3-nmi) radius Restricted Area, from ground level to ,182 m (1 , ft), over one of the proposed Aerostat sites on Niihau would marginally reduce the amount of navigable airspace in the region of influence for the duration of its proposed time of use, and would thus have a very small impact, but no adverse impact, on the region of influence s controlled and uncontrolled airspace.

4.2.1.2.2.2 Special Use Airspace

The proposed test flight operations onNiihau would have no impact on special use airspace.

4.2.1.2.2.3 Military Training Routes

There are no military training routes in the airspace use region of influence.

4.2.1.2.2.4 En Route Airways and Jet Routes

Missile launches from Niihau would be conducted within the ALTRV airspace, which would be authorized by the Central Altitude Reservation Function or appropriate ARTCC, under prescribed conditions, and would receive special handling from FAA facilities. In the application of ALTRV procedures, due consideration would be given to total user requirements throughout the navigable airspace in accordance with the procedures prescribed in FAA Handbook 1 . H, *Special Military Operations*, Chapter 3. NOTAMs would describe the area which is to be used and the duration of the ALTRV.

However, the proposed flight tests would also use Warning Area W-188, which is in continuous use from the surface to unlimited altitude. Whenever hazardous activities take place within W-188, Honolulu ARTCC would reroute IFR aircraft using the V-1 low altitude airway that passes through its southern part. As indicated in section .1.1.2.1, this is done routinely under a Memorandum of Understanding with Honolulu Combined Center/Radar Approach Control and the Oakland ARTCC with no adverse impacts to the region of influence s en route airways and et routes.

Activation of the proposed Restricted Area over the Aerostat site onNiihau would also have the potential to impact the V-1 en route low altitude airway that crosses the middle of the island. The proposed Restricted Area surrounding both proposed sites would lie within the boundaries of the airway, which extends from the surface up to, but not including, , 8 m (18, ft) MSL, and . km (nmi) on either side of the airway s center line. As such, whenever the Aerostat is used and the Restricted Area is activated at either proposed site, traffic on the V-1 airway would be required to change from its regular flight course, and would result in an adverse impact to the region of influence s en route airways.

4.2.1.2.2.5 Airports and Airfields

The proposed test flight operations onNiihau would have no impact on airports and airfields.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.2.1.3 Biological Resources—Niihau

4.2.1.3.1 No-action Alternative— Biological Resources, Niihau

4.2.1.3.1.1 Operations

Sensor-Instrumentation Operations

Potential impacts on biological resources from continued use of radar and other sensors and instrumentation at existing permanent and temporary sites under the No-action Alternative are expected to remain negligible or have no impact.

Land-based Training

Small-scale troop landing exercises could potentially disturb green sea turtle and Hawaiian monk seal individuals. However, with the implementation of appropriate mitigation measures, potential impacts on these species would be negligible and would not eopardize either species. The habitat of the Hawaiian duck, common moorhen, black-necked stilt, and American coot in and around the playas of southern Niihau would not be affected.

Low flying aircraft during the helicopter terrain following exercises have the potential to collide with birds however, this has not been a problem in the past. No sensitive wildlife is present in the interior areas of Niihau within the area traversed by the low-altitude terrain-following course. Therefore, if the same level of activity in the same areas occurs under the No-action Alternative as has occurred in the past, no impact to biological resources would be expected.

No cumulative impacts are expected to occur to the biological resources of Niihau under the continuing operations of the No-action Alternative.

In order to mitigate the potential for disturbance to individual green sea turtles and Hawaiian monk seals, brief surveys of the training exercise landing areas could be conducted to identify any individuals. In addition, consultation with Niihau elders would be undertaken to avoid known turtle nesting areas. If either of the species is present, the landing location could be modified. No other mitigations would be necessary to maintain negligible impacts to biological resources on Niihau under the No-action Alternative.

4.2.1.3.2 Proposed Action— Biological Resources, Niihau

4.2.1.3.2.1 Construction

Construction-related impacts to terrestrial biological resources are expected to be low. Clearing and removal of vegetation and modification of wildlife habitat would be required for construction of launch pads and launch support facilities. In addition, ground clearing would be necessary for construction of facilities at radar and instrumentation sites (including Aerostat), grading and surfacing of access roads, and at the proposed 1,82 -m

(, -ft) airstrip. These impacts are expected to be low at most locations because of the non-native character of the kiawe woodland that dominates the island and the non-native character of the dominant mammalian species present feral pigs and sheep. Construction noise and the increased presence of humans for construction activities is expected to have a negligible impact on terrestrial wildlife present at the Proposed Action locations. No construction is proposed near the lakes (playas) in the southern part of Niihau or near other wetland areas on the island

Any fire during ground clearance and other construction activities would have a low impact on biological resources on the island, as the island vegetation is dominated by non-native species, the wildlife is dominated by feral mammals, and there are no threatened or endangered terrestrial animals currently known to occur on the island.

Increased air traffic due to helicopters bringing supplies and personnel to Niihau would have a negligible effect on terrestrial wildlife on the island. As the vegetation on Niihau is dominated by non-native or exotic plants, negligible impact due to import of exotic species is expected. With implementation of appropriate mitigation, the import of exotic wildlife species can be eliminated.

The use of landing craft to bring supplies and personnel ashore at Site D could disturb monk seals using Site D as a haul-out area. Monk seals could also be disturbed at other existing logistics landing areas on the north shore and on the south or southwest sides (Site L) of the island. The implementation of mitigation measures could reduce the impact on the monk seals using the landing areas, and none of the proposed actions would be expected to eopardize the species. There is a potential for affecting green sea turtle nesting habitat near Site D and at other sandy beach landing areas on the island if used for landing craft. Additionally, increased movement of landing craft, boats, and ships in the Site D could potentially disturb an area near Site D which might be a shark breeding or birthing area.

4.2.1.3.2.2 Operations

The potential impacts on terrestrial biological resources on Niihau due to the Proposed Action, including launch operations and the operation and maintenance of radars and other instrumentation and communication facilities, are expected to be low. The potential impacts of missile and target launches on biological resources at launch sites and in the ground hazard areas surrounding a launch site have been evaluated in detail in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p. -22 ~~-3~~ through -3 ~~-3~~). 13
These impacts are summarized in section .1.1.3.1.1, Land-Based Operations and Training. ~~The impacts of launch noise and release of contaminants into the air as the fuel is burned have also been addressed in detail in the earlier documentation and are expected to be short-term and low level (U.S. Army Strategic Defense Command, 1 2, Feb, p. -3 through -3).~~ With adequate fire suppression and given the non-native character of the vegetation near the proposed locations, few potential impacts would occur from fires started by early launch termination. The increased presence of humans (technical personnel) at the launch sites and at the instrumentation sites would be a negligible impact since they would be restricted to staying within the sites to which they are assigned. Increased traffic on access roads and increased air traffic (fixed wing and helicopter) would have a negligible impact on biological resources. No terrestrial

threatened or endangered biological resources are expected to be affected by the Proposed Action operations on Niihau.

Potential impacts to marine biological resources are predicted to occur. Impacts could be increased if additional traffic in the Site D bay and the other authorized landing craft landing area disturb monk seals that are hauled out to bask, or possibly pup. Disturbance of green sea turtle nesting sites in the Site D and other sandy beach areas could also occur. However, the operational activities of the Proposed Action are not expected to affect viability or eopardize the continued survival of either of these two sensitive species. Increased boat and barge traffic could disturb shark breeding and birthing activity in the Site D area, but the impact is expected to be low because of the intermittent nature of the traffic.

The potential impacts of unspent solid and liquid fuels on marine resources, including subsistence fisheries, following an early flight termination event are expected to be negligible. Unburned solid fuel is hard and rubber-like. The AP dissolves slowly out of the rubber-like binder. The AP produces ammonia and chlorine, which are dispersed into the ocean. The aluminum oxide in the solid fuel is insoluble. As the solid fuel dissolves slowly, the outer layers become spongy, which further retards the dissolution rate. No toxic levels of ammonia, chlorine, or aluminum release from the solid fuels are expected (U.S. Army Strategic Defense Command, 1   2, Feb, p.2-28). Liquid fuels that may potentially be spilled as a result of an 13
early flight termination are lighter than water and are volatile. They would be expected to float to the surface and evaporate quickly. Since the quantities are small, less than 3   L (1   gal), the potential impacts are expected to be negligible and would not have a residual effect on the marine biological resources.

In terms of the potential for cumulative impacts, since no other pro ects are known at this time which could be expected to impact the terrestrial biological resources, no cumulative impacts are expected to affect the terrestrial resources on Niihau.

Implementation of mitigation measures could reduce the potential for impacts to affect biological resources on Niihau as a result of the Proposed Action. Mitigation measures could include:

- Monitoring beaches for the presence of Hawaiian monk seals by Niihau residents before landing and either waiting for their departure or conducting landings elsewhere if possible

- Monitoring beaches for the presence of green sea turtles by Niihau residents before landing and either waiting for their departure or conducting landings elsewhere if possible

- Providing fire suppression equipment at launch sites

- Restricting pro ect personnel to the facilities where their pro ect responsibilities will be carried out

- Obtaining prior approval for all site alterations

- Checking equipment and personnel for inadvertent pest transportation to the island
- Prior to construction of an airstrip on Niihau, a hazing plan would be developed in consultation with USFWS to avoid potential bird impacts to aircraft using the airstrip.

4.2.1.4 Cultural Resources—Niihau

Due to the island s undisturbed nature, it would be prudent to assume that any coastal or sandy beach dune area in Niihau could be considered potentially sensitive in terms of traditional Hawaiian cultural resource potential. The same would apply to post-European contact historic resources in the same areas.

4.2.1.4.1 No-action Alternative— Cultural Resources, Niihau

PMRF s current activities on Niihau consist of the operations and maintenance of instrumentation and support sites, downed-pilot training exercises, and small unit, special warfare amphibious landing exercises. The latter two exercise operations have the potential to affect as yet unknown and undocumented cultural resources on Niihau.

In terms of the potential for cumulative impacts, no activities, other than those currently conducted by PMRF on Niihau would be implemented under the No-action Alternative. The impact to potential cultural resources as a result of downed-pilot training exercises and small unit, special warfare amphibious landing exercises is as yet unknown. Niihau elders report no adverse impact from these activities.

No mitigation measures would be necessary for the instrumentation support sites. These areas are composed of a built environment and are not situated in or near culturally sensitive areas. These sites are remotely controlled, and the number of personnel needed to service them is kept to a minimum. Personnel are ferried from PMRF to the instrumentation sites by helicopter.

The downed-pilot training and amphibious exercises that the Navy conducts on Niihau could affect potential cultural resource areas on the island. A Section 1 Consultation and Review will be conducted as a part of this EIS (see appendix K). This would involve field inspection and identification of cultural resources in the areas where the Navy conducts (or intends to conduct) its operations and the surrounding areas. Mitigation recommendations would be based on the nature and extent of the cultural resource materials identified. Evaluations of identified cultural resources would be based on NRHP eligibility criteria. When these evaluations have been made, the appropriate measures would be taken to mitigate impacts to those resources or properties considered eligible.

4.2.1.4.2 Proposed Action— Cultural Resources, Niihau

Potential impacts to cultural resources could occur as a result of pro ect implementation construction for a proposed aircraft airstrip, road construction or improvements, firebreaks, missile launch sites, and instrument support. These activities would include ground clearing, subsurface excavation disturbances, construction-related vibration, and increased vehicular traffic through previously undisturbed areas. These activities could also create a potential fire hazard on the island.

Potential impacts to cultural resources could also occur as a result of pro ect implementation operations activities. Increased personnel on the island could present an impact through the disturbance of historic properties and incidental removal of archaeological and historic resources however, the established protocol prohibits the removal of anything fromNiihau, including artifacts (see appendix G).

Adverse impacts to cultural resources within the region of influence could occur as a result of debris generated by a launch-pad mishap or as a result of an accidental launch vehicle ground strike. Impacts to cultural resources could also occur as a result of accidental ignition of vegetation as a result of missile launch operations. The probability of this is extremely remote. During the dry season, fire breaks could provide adequate protection against the spread of fire. The probability of this occurring, however, is extremely remote. Exposure to certain levels of noise-induced vibration resulting from missile launches could be potentially detrimental to the structural integrity of existing structures, but this probability is remote.

Impacts to potentially historic buildings and structures are expected to be not significant as a result of short duration noise-induced vibrations produced by the Proposed Action. Potential impacts to prehistoric and historic buildings and structures could also result from construction and operational activities associated with Aerostat instrumentation sites. The long-term operational effects of an Aerostat to its environmental vicinity (e.g., ground vibrations) have not been fully assessed.

In compliance with the NHPA Section 1 review and comment process and the ACHP s regulations implementing Section 1 (3 CFR 8), PMRF would consult with the island s proprietors, the community of Niihau, the SHPO Hawaii, and the ACHP to establish and/or implement measures to ensure mitigation of any adverse impacts to potential cultural resources that could result from PMRF s proposed actions on Niihau (see appendices K and N).

Cumulative impacts to cultural resources on Niihau could result from construction and other ground disturbing activities related to missile launch operations. Impacts could also result from operational activities once these facilities are in place. An increased presence of military and construction personnel in or near archaeologically sensitive areas could result in the degradation or destruction of otherwise intact pre-historic and historic sites. However, with the proprietors guidance, all activities on Niihau would avoid these sites.

~~In compliance with the NHPA Section 1 review and comment process and the ACHP s regulations implementing Section 1 (3 CFR 8), the U.S. Navy and PMRF will consult with SHPO Hawaii, the ACHP, the island s elders, and proprietors.~~

Through implementation of the appropriate pre-construction studies, monitoring, consultation with the Hawaii SHPO, and by following U.S. Navy and PMRF guidelines for protection of historic resources, adverse effects to these resources can be reduced or eliminated.

Consideration of any siting locations on Niihau would be preceded by complete cultural resources field inspection of those sites and their surroundings. Cultural resources discovered as a result of field surveys will be investigated and evaluated in terms of NRHP eligibility criteria. When these evaluations have been made, appropriate measures would be taken to mitigate impacts to those resources or properties considered eligible. A qualified archaeologist, acceptable to the land owner, would assist the island elders in monitoring the siting areas during construction and all ground disturbing activities.

All construction and flight preparation and support personnel would receive an orientation involving a definition of cultural resources and the applicable protective Federal, State, and local regulations. Construction and operations personnel would be restricted to designated archaeologically non-sensitive areas during their stay on the island, in order to protect cultural resources.

4.2.1.5 Geology and Soils—Niihau

The physical structure or chemical composition of soils and underlying rock on the island of Niihau could potentially be affected by construction or launch activities. The region of influence for this resource includes the land identified for potential new construction, and ground hazard areas associated with proposed launch facilities.

4.2.1.5.1 No-action Alternative— Geology and Soils, Niihau

Under the No-action Alternative, PMRF activities would continue and no ground disturbance or activities ~~that~~ would result in soil contamination ~~would occur~~ therefore, no impacts to geology and soils would occur.

No other activities that would result in cumulative impacts to geology and soils have been identified.

No mitigation measures for geology and soils are proposed.

4.2.1.5.2 Proposed Action— Geology and Soils, Niihau

The Proposed Action includes new construction of a target missile launch facility, an interceptor launch area, telemetry and instrumentation, Aerostat Site, an airstrip, reinforced operations shelter, and associated road improvements. The Proposed Action will also result in the launching of target and interceptor missiles which will emit fuel residues, or potentially create spills which could contaminate the soil in the vicinity of the test launch.

Minor soil disturbance will be limited to the immediate vicinity of two potential launch pads and associated support structures, a potential 1,82 -m (, -ft) airstrip, potential Aerostat and associated instrumentation sites, and potential telemetry and instrumentation sites. New construction will be of short duration. The base will use best management practices to reduce the potential for soil erosion during construction.

Proposed target missile launches at Niihau may use solid or pre-packaged liquid fuel propellants, whereas solid fuel propellants will be used exclusively for interceptors.

Potential soil contamination could occur from rocket emissions forming hazardous residues in concentrations which would dictate a hazard to human health, or, in the event of an early flight termination, burning fuel may reach the ground. During nominal launches of a solid propellant missile, the primary emission products would include hydrogen chloride, aluminum oxide, carbon dioxide, carbon monoxide, nitrogen, and water.

No significant changes to soil chemistry are predicted to occur as a result of hydrogen chloride or aluminum oxide deposition from solid fueled target and interceptor launches. As described in the Air Quality section, soil deposition of hydrogen chloride is expected to be minimal because relatively small amounts of hydrogen chloride are released in the booster ground cloud and the emissions disperse rapidly. In addition, no launches will occur during rain, and the launch system will not use a water deluge system for cooling and noise suppression (a deluge system could increase the potential for ground deposition). No measurable direct or indirect, short-or long-term effects on soil chemistry are expected.

Potential deposition of aluminum oxide per launch is expected to be relatively small. Previous studies of solid-fueled rocket emissions, performed by the Department of Energy at KTF, predicted that soil deposition of measurable levels of aluminum oxide resulting from a moving
exhaust cloud should be negligible (U.S. Army Strategic Defense Command, 1 2, p. -3). 13

In the unlikely event of an on-pad fire or early flight failure over land of a solid propellant missile, most of the fuel would likely burn up before being extinguished. Any remaining fuel would be collected and disposed of as hazardous waste. Soil contamination which could result from such an incident is expected to be very localized at the point of the fire.

An on-pad spill or catastrophic missile failure of a pre-packaged liquid-fueled missile over land could result in the release of UDMH fuel and IRFNA oxidizer. UDMH is heavier than air, and if not oxidized when airborne will react and/or possibly ignite with the porous earth or will form dimethylamine and oxides of nitrogen. All of these substances are soluble in water. On further oxidation of the dimethylamine, the amino substances serve as nutrients to plant life. Airborne nitrogen dioxide would return to earth as nitric acid rains in precipitation events and would react with the calcium carbonate soil to form the nitrates which are used in fertilizer for plant life (U.S. Army Space and Strategic Defense Command, 1 , May, p. -2 through -
21). 13

Likewise, IRFNA that reached the ground would react with the calcium carbonate soils to form
calcium nitrates (U.S. Army Space and Strategic Defense Command, 1 , May, p. -21). 13
Calcium nitrate, a strong oxidizer, is a dangerous fire risk in contact with organic materials, and
may explode if shocked or heated (U.S. Army Space and Strategic Defense Command, 1 ,
May, p. -21). Therefore, depending on the amount of the propellant and/or oxidizer released, 13
soils contaminated with these liquid propellants may require removal to prevent subsequent fires or explosions. Calcium nitrate is also water soluble, so it is anticipated that any residual material or unreacted fuel would be washed into the groundwater or directly out to sea.

No other activities that could result in cumulative impacts would occur along with PMRF operations. The launch of up to eight missiles a year would not result in any cumulative impacts to soil conditions on Niihau. No other cumulative impacts have been identified.

Various mitigation measures could be implemented to reduce water erosion of slopes. These measures could include minimizing the amount of area exposed during grubbing, use of soil stabilizers, use of sandbags for diverting flow and creating sediment basins, adding protective covering to slopes, such as mulch, straw, plastic netting, or some combination thereof, and revegetating slopes and open areas as soon as possible to enhance long-term stability.

4.2.1.6 Hazardous Materials and Hazardous Waste—Niihau

This section describes the potential impacts from hazardous materials and hazardous wastes that could occur from the No-action Alternative and the Proposed Action.

4.2.1.6.1 No-action Alternative— Hazardous Materials and Hazardous Waste, Niihau

Under the No-action Alternative, PMRF would continue ongoing activities at Niihau. The primary hazardous material/hazardous waste issues associated with these activities is the fueling and maintenance of diesel generators which are operated intermittently to power remotely operated radar and the electronic warfare facility. These materials would continue to be handled in accordance with PMRF hazardous materials and hazardous waste plans described under the affected environment. Past handling of these materials at Niihau has not resulted in any impacts to the environment around the facilities. PMRF only brings hazardous materials onto the island when required for maintenance. There are no IRP sites on Niihau. The covert penetration operations only involve military personnel trying to avoid detection by ground observers and do not involve the use of any hazardous materials.

PMRF currently flies AEGIS target drones along the east coast of the island away from inhabited areas. The drones do not fly over occupied areas, however, there is the potential for a drone to crash and deposit hazardous waste onto the island. PMRF Hazardous Material Spill Response Team would be dispatched to the crash site of any mishap to ensure proper removal of all hazardous material/hazardous waste. To date, no crashes have occurred on Niihau.

Overall, no adverse hazardous materials or hazardous waste impacts would occur from implementation of the No-action Alternative.

In terms of the potential for cumulative impacts, PMRF uses minimal amounts of hazardous materials and hazardous waste on the Island of Niihau. As described above, except for diesel fuel, PMRF does not leave any hazardous materials or hazardous waste on the island. The only other activities that could result in cumulative impacts would be those associated with Niihau Ranch however, the amounts of materials used by both Niihau Ranch and PMRF would continue to be small and would not result in any cumulative impacts.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.2.1.6.2 Proposed Action— Hazardous Material and Hazardous Waste, Niihau

Under the Proposed Action, PMRF would continue to operate the existing radar facility and electronic warfare facility on Niihau and construct and operate target and interceptor facilities, a 1,82 -m (, -ft) airstrip, telemetry sites, and improved road access.

Construction of new facilities would be conducted in accordance with the Corps of Engineers Safety and Health Requirements Manual. Construction of new facilities is routinely accomplished for both military and civilian operations and presents controlled amounts of hazardous materials and hazardous waste required for the performance of the construction activity. Hazardous materials used during construction would include engine oil, oil filters, paint, paint thinners, and solvents generated during maintenance of equipment and facility construction. Construction activities would be handled under existing PMRF spill plans, and all hazardous materials and hazardous waste would be handled in accordance with State and Federal regulations.

Under the Proposed Action, there would be an increase in the amounts of hazardous materials used and hazardous waste generated on Niihau. These materials would consist of solid and liquid propellant missiles, diesel fuels for generators, and solvents and paints required for facility maintenance. Hazardous materials use and hazardous waste generation would be minimized in accordance with PMRF Hazardous Waste Management Plans. Hazardous materials would only be brought onto Niihau when required for use and would not be permanently stored onsite. All hazardous waste would be shipped from Niihau for proper disposal in accordance with Federal and State regulations after generation and would not be permanently stored onsite in accordance with the Niihau Protocol (appendix G). The increased requirements for diesel fuel would be handled similar to current conditions on the island. All diesel fuel would be stored in aboveground storage tanks.

Pre-packaged liquid propellant target missiles (UDMH and IRFNA) would arrive at Niihau at either Site D or L (see figure .2.1. -1) by barge from PMRF. The pre-packaged liquid propellant missiles would only be brought to Niihau when required for use and would not be permanently stored on the island. The self-contained liquid propellant missiles would only be used on the north end of the island and would not be transported through the village. Fueled target missiles would be handled in accordance with approved SOPs. Such handling is routinely accomplished and would not be expected to present a significant potential for fuel release. Certain pre-launch emergency conditions could require the defueling of a target missile at the launch site. The transfer of propellants in such cases would be accomplished in accordance with standardized transfer procedures. These procedures would address the methods to be employed for propellant transfer and specify the container requirements for propellants downloaded from the target missile (storage containers would be on the island for de-fueling, if required). Spill containment kits and a qualified hazardous material spill response team would be available on Niihau. In addition, any contaminated areas would be remediated. Launches of liquid propellant systems would occur on concrete pads or a cleared area with appropriate spill containment berms to contain any accidental release of liquid propellants.

All potentially hazardous debris resulting from an accident of either a solid or liquid propellant missile on the launcher or from early flight termination would be contained entirely within the ESQD or ground hazard area. Teams would be available for fire suppression and hazardous materials emergency. All hazardous materials generated during a missile mishap would be cleaned-up and remediated by PMRF and disposed of as hazardous waste in accordance with State and Federal regulations.

Overall, no adverse hazardous materials or hazardous waste impacts would occur from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, the increased amounts of hazardous materials used and hazardous waste generated under the Proposed Action in combination with the No-action Alternative could result in cumulative hazardous materials and hazardous waste impacts if a spill or misuse of these materials occurred. However, as described above, PMRF would have the appropriate management plans in place to minimize any potential for a hazardous material or hazardous waste to impact the environment. PMRF would not leave any hazardous materials or hazardous waste on the island and would quickly remediate any spill of these materials. All hazardous wastes will be shipped from Niihau in accordance with State and Federal regulations after generation and would not be permanently stored on-site, in accordance with the Niihau Protocol (appendix G). No other activities on Niihau that could result in cumulative impacts have been identified.

Potential mitigation measures could include the expansion of the SPCC to address the proposed additional activities on Niihau and the application of PMRF waste management procedures to Niihau activities.

4.2.1.7 Health and Safety—Niihau

4.2.1.7.1 No-action Alternative— Health and Safety, Niihau

Under the No-action Alternative, PMRF would continue with ongoing activities on Niihau. The primary health and safety issues associated with these activities is the generation of EMR emissions from radar and electronic warfare operations. The covert penetration operations only involve military personnel trying to avoid detection by ground observers and do not involve any hazardous operations to the public.

EMR emissions do not represent a health and safety risk to the island residents because the radar and Perch site electronic warfare sites are located away from the island village. The radar unit is located on top of a facility and presents no HERP hazards at ground level where ~~any~~ island residents could be affected. During operation of the Perch site, appropriate warning lights and signs are placed around the facility.

In addition to the EMR hazard, PMRF flies AEGIS target drones along the east coast of the island away from inhabited areas. Because the drones do not fly over occupied areas, there is no direct health and safety risk however, there is the potential for a drone to crash and start a brush fire on the island. During operations that present the potential for fires, a ground fire-fighting crew and helicopters with water buckets are airborne to minimize any fire hazard.

Overall, no adverse health and safety risks would occur from implementation of the No-action Alternative.

In terms of the potential for cumulative impacts, the only health and safety issues are associated with the operation of the radar facility and theoverflight of AEGIS target drones, no other activities on Niihau would combine with these operations and result in a cumulative health and safety risk.

No mitigation measures for health and safety are proposed.

4.2.1.7.2 Proposed Action— Health and Safety, Niihau

Under the Proposed Action, PMRF would continue with ongoing activities onNiihau and construct and operate target and interceptor facilities, a 1,82 m (, ft) airstrip, telemetry sites, and improved road access. Associated with these sites would be the establishment of ESQDs and ground hazard areas before and during launch.

Construction of new facilities would be conducted in accordance with the Corps of Engineers Safety and Health Requirements Manual. Construction of new facilities is routinely accomplished for both military and civilian operations and presents only occupational-related effects on safety and health for workers involved in the performance of the construction activity. The siting of launch facilities, ordnance, and instrumentation would be in accordance with DOD standards, taking into account HERO, HERP, HERF, ESQD, and other facility compatibility issues. Because the portion of the island proposed for use is unoccupied, no health and safety risk to personnel would occur except during operations. It is the policy on Niihau to minimize the contact between island residents and workers brought to the island. This policy would continue under the Proposed Action, which would minimize the potential for an island resident to contract any illnesses that construction and operations workers may have.

Before installation or use of any new radar or telemetry unit, the Navy conducts an EMR hazard review that considers hazards of EMR on personnel, fuel, and ordnance. The review provides recommendations for sector blanking and safety systems to minimize HERP, HERF, and HERO exposures. The proposed systems would have appropriate safety exclusion zones established prior to operation, and each unit would have warning lights to inform personnel when the system is emitting EMR. Since island residents would not be exposed to EMR, there would be no health and safety risks associated with operation of the radar units. Because the proposed airstrip would be located in an undeveloped part of the island and no structures are within the flight paths, no health and safety risks would occur to island residents. In addition, it is expected that there would be approximately 1 flights a year to the island. Given that the Air Force only has 1. mishaps per 1 , flying hours, the potential for an aircraft accident is minimal. The vegetation around the airstrip would be cleared to prevent any potential for fire should a mishap occur. Transportation of hazardous materials onNiihau would be conducted under DOT regulations, and the generation of hazardous waste would be in accordance with Federal and State regulations.

Fueled liquid target missiles (UDMH and IRFNA) would arrive atNiihau by barge from PMRF and transported on the island by truck. Fueled target missiles would be handled in accordance with approved SOPs. Such handling is routinely accomplished and would not be expected to present a significant potential for propellant release. Personnel within the hazard zone engaged in transfer operations would be required to use approved skin and respiratory protection to provide acceptable protection against propellant hazards. At the conclusion of each transfer operation, personnel and equipment would be thoroughly decontaminated to remove all traces of any released propellants. To minimize any potential for soil to become contaminated and affect human health either directly or indirectly through food transfer, spill containment kits and a qualified accident response team would be available on Niihau. In addition, any contaminated areas would be remediated. Mitigation measures developed to minimize any potential spill are addressed below.

Missile and launch preparation activities conducted at Niihau would be in accordance with the same safety procedures used at PMRF taking into account any unique Niihau environmental conditions. These procedures would address such explosive safety issues as grounding during handling, approved use of slings, hoist, and cranes, static electricity protection, use of hand powered tools, and personnel training requirements. Approval for all procedures must be obtained from PMRF and Naval Air Warfare Center Safety Offices. Review of historical records shows that there have been no accidents involving the handling of missile components that have resulted in an explosion or fire at PMRF.

On Niihau, there is the potential for a mishap with the liquid propellant target systems. These systems would arrive on Niihau already fueled and consist of UDMH/IRFNA prepackaged systems. The liquid propellant missiles would only be used from the proposed north launch site on the island, therefore avoiding transportation of the liquid propellant missiles near the village. Potential impacts of a mishap would be similar to PMRF. Although unlikely, there is the potential for a fuel tank rupture causing one of the liquid propellants to spill either during transportation on the island or during an early flight termination. An IRFNA or UDMH tank rupture has the potential to result in toxic gases being released. The emergency response team would quickly respond to such a mishap. The results of modeling a 1 -minute spill of the IRFNA tanks (1,83 L 8 gal) indicated the 2ppm TLV would be exceeded up to 31 m (1, 2 ft) from the spill point. The 2 ppm IDLH level would be exceeded up to 2 m (ft) from the spill point. The results of modeling a 3 -minute IRFNA spill indicated the 2ppm TLV would be exceeded up to 88 m (2, ft) from the spill point. The 2 ppm IDLH level would be exceeded up to the same distance as for a 1 -minute spill. The results of modeling a 1 -minute spill for UDMH (21 L .8 gal) indicated the . ppm TLV would be exceeded up to m (1, 3 ft) from the spill point. The 8 ppm IDLH level would be exceeded up to 8 m (1 8 ft) from the spill point. The results of modeling a 3 -minute spill indicated the . ppm TLV would be exceeded up to 8 m (2, ft) from the spill point. The 8 ppm IDLH level would be exceeded up to 8 m (1 8 ft) from the spill point or the same distance as for a 1 -minute spill. However, since PMRF would respond to such a mishap, it is unlikely that an entire tank would rupture and spill unmitigated for more than a couple of minutes. None of the above spills would impact the village on the Island of Niihau, which is approximately 13 km (8 mi) from the transportation and launch sites.

A termination over the ocean would result in the target system impacting the water where the IRFNA and UDMH would mix and dilute with the ocean. If the flight termination results in rupture of both tanks, the fuels would be consumed in the fire.

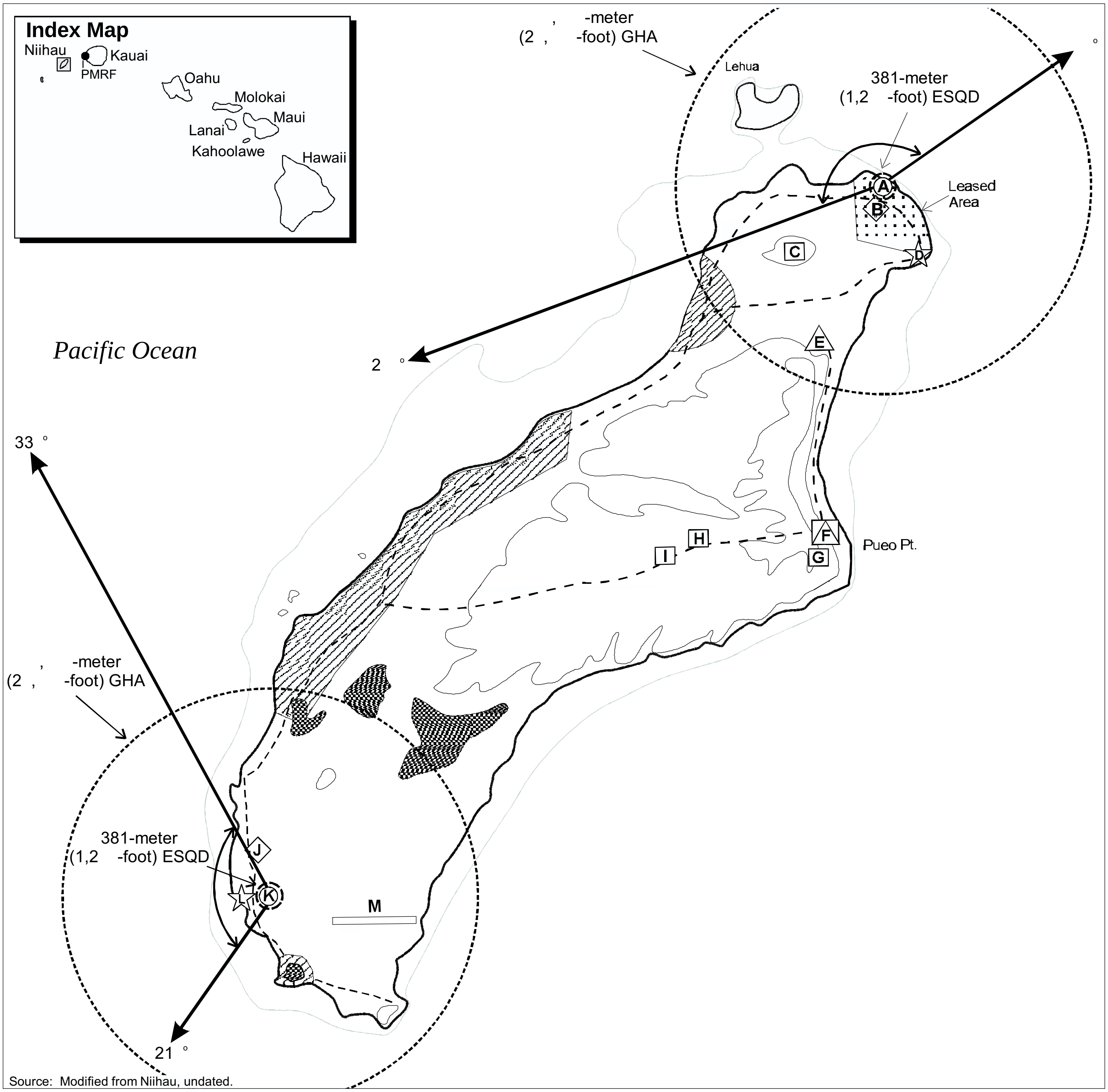
A pre-launch accident on the launcher would be characterized by either an explosion and/or detonation of the missile propellants, or a situation in which the missile propellants burn without detonation or explosion. An ESQD surrounding the launcher is calculated based on the equivalent explosive force of all propellant and pyrotechnic materials contained on the flight vehicle. All potentially hazardous debris resulting from an accident on the launcher would be contained entirely within the ESQD, which would already have been cleared of unprotected personnel. The ESQD varies from missile to missile but is typically 381 m (1,2 ft). Teams are available for fire suppression, hazardous materials emergency response, and emergency medical response during launch operations.

Before any missile launch from Niihau, a ground hazard area and launch hazard area (tra ectory azimuth) would be established, taking into account the size and flight characteristics of the missile, expected wind conditions, individual flight profile for each exercise or flight test, and reaction time between recognition of a flight malfunction and the decision to terminate flight. The ground hazard area and launch hazard area are areas where all potentially hazardous debris would fall should a launch anomaly or flight termination occur. For launches from Niihau, the maximum ground hazard area would be , m (2 , ft) for unguided interceptors (figure .2.1. -1). This figure also shows the flight corridor azimuth limits for launches from Niihau. Non-mission-essential personnel would be excluded from the ground hazard area during launch operations. Personnel working within the ground hazard area would be protected in bunkers or behind berms. Because personnel would be excluded from the ground hazard area during launch, no health and safety risks from potentially hazardous debris would occur. The ground hazard area would not include the village on the island.

The launch hazard area would encompass that area downrange over the ocean within the missile flight corridor. Prior to launch, all missile intercept, debris, and stage impact areas would be determined cleared of the public and non-essential personnel.

As a result of a nominal (successful) launch, the only identified potential hazard is the inhalation of rocket motor exhaust products released during the first few seconds of the launch operation. Concentrations for solid propellant missiles are expected to reach undetectable levels by the time the plume reaches the boundaries of the ground hazard area or launch hazard area. Thus, residents on Niihau would not be exposed to concentrations exceeding the exposure limits.

Termination of flight shortly after liftoff would result in potentially hazardous debris being contained within the ground hazard area or launch hazard area, where the public and non-essential personnel would be excluded. Personnel within the ground hazard area would be protected in the reinforced concrete operations shelter. ~~bunkers or behind berms.~~ Air emissions from the flight termination could pose a health threat however, modeling conducted for solid propellant missiles determined that airborne pollutants from a terminated launch would not exceed health-based standards outside of the ground hazard area and, therefore, would not endanger the public outside the ground hazard area. Potential impacts of a liquid fuel tank rupture are addressed above. Because of the high fire danger on Niihau during the summer months, fire breaks would be cleared around the launch site~~, and fire fighting equipment would be present during launches~~. Prior to a launch, a Missile Accident Emergency Team, which includes fire suppression capability, would be positioned at the



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EXPLANATION

- Joint Use Approved Areas
- Keep Out one
- Lakes (Playa)
- Contour Lines
- Dirt Roads
- , -meter (2 , -foot GHA (Ground Hazard Area)
- 381-meter (1,2 -foot ESQD (Explosive Safety Quantity-Distance)

NORTH

Scale

2.3 . Kilometers

1. 2.8 Miles

- Existing Logistics Landing Sites

Potential New Facility Locations

- Aerostat Site
- Communication Site
- Launch Site
- Launch Control Area
- Aerostat and Communication Site
- Airstrip
- Flight Corridor Azimuth Limits
- PMRF Pacific Missile Range Facility

Potential Ground Hazard Areas and Flight Corridor Azimuth Limits - North and South Launch Sites (Revised)

Niihau, Hawaii

Figure 4.2.1.7-1

niihau hs 1

edge of the ground hazard area. The fire equipment would consist of a water truck, a bulldozer, and ~~a~~ helicopters airborne with buckets.

Potentially hazardous debris which would impact the ground on the island should a flight termination occur could present a health and safety risk. The material would consist of metals, solid propellant, and batteries (such as nickel cadmium and potassium hydroxide). Much of the hazardous material would be consumed in the launch anomaly. After such a flight termination or launch anomaly, potentially hazardous debris would be recovered from Niihau and disposed of in accordance with Federal and State hazardous waste regulations. Most liquid propellants would be consumed in a flight termination or launch anomaly and would not represent a health risk. The potential for a liquid propellant tank rupture is addressed above. As addressed under water resources and biology, any solid propellant that falls into the surrounding ocean would not affect water quality or contaminate fish used by residents for subsistence therefore, the pollutants would not enter the food chain and pose a health risk to island residents. Moreover, the salt ponds at the southern end of the island would not be impacted by launch debris in the event of a flight termination.

Termination of flight after the target or defensive missile has left the launcher would occur over open water within the launch hazard area, which would be cleared prior to launch. Because the termination would occur over open water away from the public, it would not pose any public health risks.

The Aerostat would be used on Niihau during TBMD and TMD operations. The potential health and safety issues would be associated with EMR emissions and aircraft coming in contact with the tether cords attaching the Aerostat to the ground. As with any EMR operations, PMRF would conduct a HERP, HERF, and HERO survey prior to using Aerostat. This survey would include development of appropriate personnel exclusion zones for both ground testing and air operation of the system. During ground testing the area in the EMR hazard zone would be contained within a security fence constructed around the site. Therefore, there would be no hazard to island residents from EMR exposure. When the Aerostat would be operated from , 2 m (1 , ft) mean sea level, ~~where~~ there would be the potential for low-flying aircraft to come in contact with the system tethers or EMR emissions. To avoid any health and safety issues during operation, there would be a .8-km (3-mi) aircraft exclusion zone around the system. In addition, the system would have a transponder and beacon to warn aircraft.

Overall, no adverse health and safety risks would occur from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, the missile launch activities at Niihau would increase the potential for a large fire to occur on the island, especially during the summer months when the vegetation is dry. To reduce the potential for fire, fire breaks would be cleared around the launch facilities and fire fighting equipment would be available on the island for each launch. No other potential cumulative health and safety issues are expected.

In terms of mitigation measures, because Niihau is remote and does not have appropriate medical facilities, prior to any construction or launch operation, one member of the team w~~e~~ould be a trained medical technician with the appropriate equipment to provide initial medical treatment until an in ured person can be moved to appropriate medical facilities if an in ury occurs.

To minimize the ~~potential~~ possibility for potentially hazardous debris to contaminate soils from a terminated launch and affect the health of island residents or livestock, areas near the flight termination would be monitored for potential contamination levels above health-based standards. The monitoring could be done to measure the specific constituents of the hazard.

No additional mitigation measures are proposed since the Proposed Action would exclude residents and non-essential personnel from potential impact sites.

4.2.1.8 Land Use—Niihau

4.2.1.8.1 No-action Alternative— Land Use, Niihau

4.2.1.8.1.1 Land Use

Under the No-action Alternative, PMRF would continue to use thePaniau radar and Perch sites on Niihau, lease land, and conduct downed-pilot survival training, special operations forces, and terrain following helicopter exercises. The use of thePaniau radar and Perch sites and any associated EMR safety zones are compatible with the undeveloped and grazing uses ad acent to the site. The site is also compatible with the State and county of Kauai agricultural designation of the island because it limits any future conflicting uses. The training exercises are also compatible with the open undeveloped uses of the island. PMRF s lease of the northern end of the island allows for continued use byNiihau Ranch and does not affect the existing open nature of current land uses.

The continuation of training activities and radar use under the No-action Alternative would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. Activities at the site do not affect any recreational opportunities. The use of the site does not affect any historic or prehistoric resources. The sites do alter the visual undeveloped nature of the area immediately ad acent to the facilities, but they are painted in earth-tone colors and are not visible from the island village. Biological resources are not affected by PMRF activities conducted under the No-action Alternative.

4.2.1.8.1.2 Recreation

There are no developed recreational areas near the radar site. Continued use of the radar and electronic warfare sites on Niihau does not limit any recreational opportunities to the island residents.

Overall, no adverse land use impacts would occur from implementation of the No-action Alternative.

In terms of the potential for cumulative impacts, the area at the site has been maintained for grazing, and no changes to this use have occurred except the development of the PMRF radar site. No cumulative impacts to lands are expected.

Potential mitigation measures could include development of a Fire Suppression Plan.

4.2.1.8.2 Proposed Action— Land Use, Niihau

Under the Proposed Action, PMRF would continue to operate the existing radar and electronic warfare facilities on Niihau and construct and operate target and interceptor facilities, a 1,82 -m (, -ft) airstrip, telemetry sites (e.g., radars, communication), Aerostat, and improved road access. Associated with these sites would be the establishment of ESQDs and ground hazard areas before and during launch.

Most of the land use on Niihau is open and used for grazing. The establishment of facilities under the Proposed Action would occur within these existing land uses. The land and safety requirements required for the launching of missiles, telemetry sites, Aerostat, and the use of an airstrip would be compatible with the open/grazing uses of Niihau and the State and county agricultural zoning designation of the island. The construction of these facilities would not occur near the village on Niihau.

The required ESQDs and ground hazard areas for missile launch activities would occur over open land used for grazing, subsistence fishing, and shell gathering on the northern and southern ends of the island. The open undeveloped nature of the land would be compatible with the ground hazard areas and ESQDs. The land area associated with the ESQDs would only encompass an area of 381 m (1,2 ft) where access would be restricted for up to 1 days per launch for each launch or 112 days per year between the two launch sites. The ESQDs would only include land used for grazing by island livestock. The livestock would be allowed to continue to graze within the ESQD arc. Therefore, current land use activities would continue even during launch operations, with the only restriction being to the island within the 381-m (1,2 -ft) ESQD arc.

The land uses within the ground hazard area would continue except during launch operations, when the area would be determined clear for safety purposes for approximately 3 minutes per launch for up to eight launches per year (a total of hours per year). The residents on Niihau would be warned of these closure times 1 week in advance of launch time. Therefore, current land use activities would continue and would be altered only temporarily by limiting access to the grazing (grazing by the island livestock would not be affected by launch operations), fishing, and shell gathering areas at either the northern or southern ends of the island for up to hours per year and would not result in a substantial loss of time for these activities. The remainder of the island would be available for grazing, fishing, and shell gathering activities during launch operations. PMRF activities would not affect the village area. Mitigation measures described below would further minimize potential impacts to fishing.

Safety requirements of the ground hazard area would be compatible with the open nature of Niihau. Access to the island is restricted, and there is no development on the island, so the requirement to verify the area clear for up to hours per year would not affect the current open land uses.

The activities associated with the Proposed Action would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. Activities on the island would only temporarily affect recreational opportunities for island residents for up to hours per year. The development would alter the visual undeveloped nature of the island but represents less than one percent of the total island area. Proposed ground disturbing activities are not expected to impact biological resources. Operations (e.g., missile launches, use of landing craft) may disturb monk seals and green sea turtles however, activities are not expected to eopardize the existence of these species. Mitigation measures to minimize impacts have been developed. Ground disturbing activities could also affect cultural resources. PMRF, in consultation with the SHPO, would develop guidelines to avoid such impacts.

4.2.1.8.2.1 Recreation

There are no developed recreational areas onNiihau. Recreational activities conducted by island residents, Niihau Ranch, and Kauai dive companies would only be restricted within the ground hazard area for up to hours per year. Other areas on the island would be available for use during this time.

Overall, no adverse land use impacts would occur from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, the area at the site has been maintained for grazing, and no changes to this use have occurred except the development of the PMRF radar and electronic warfare sites, the Niihau village, and some Coast Guard facilities. The addition of the two launch facilities, radar sites, Aerostat, and airstrip would represent further development of the island. However, this development would include less than one percent of the island area and would not represent a cumulative change to the existing grazing/open uses where development would occur. Grazing would be allowed to continue around the facilities. The establishment of the ESQDs and ground hazard areas would only temporarily limit access to areas on the island as described above andwould not affect grazing by livestock.~~ would not be affected.~~ No other activities on Niihau would contribute to these cumulative effects.

In terms of mitigation measures, the best fishing times and locations on Niihau are considered sensitive information. PMRF could work with island residents to avoid conducting operations that would exclude residents from their fishing areas during the best times of day.

4.2.1.9 Noise—Niihau

4.2.1.9.1 No-action Alternative— Noise,Niihau

The low population density and lack of industry onNiihau promote a noise environment where the ma or noise sources are all natural. These factors include wind, rain, and animals. Secondary, intermittent sources include PMRF exercise flights. Theseoverflights will generate high noise levels. However, these are discrete events, relatively few in number, and restricted as to the actual geographic locations in which they are allowed to occur. The land-based training generates relatively low levels of noise in isolated areas. As such, the No-action Alternative is anticipated to have no adverse impact on the island s noise environment.

No cumulative impacts are currently identified for the No-action Alternative at Niihau.

No mitigation measures are for noise are proposed.

4.2.1.9.2 Proposed Action— Noise, Niihau

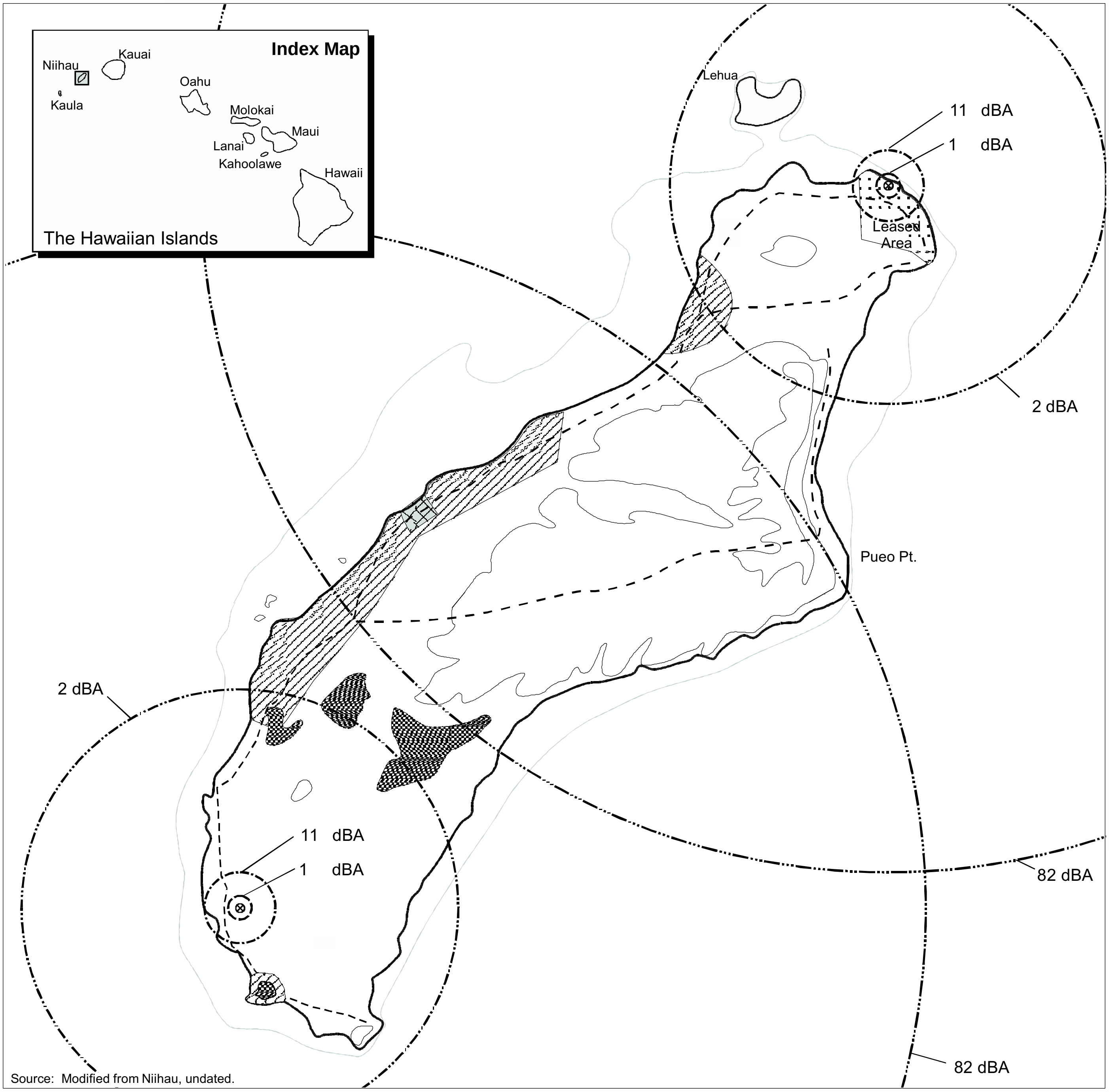
Due to the lack of industry and low population density, any addition to the noise environment would be quite noticeable. Impacts to the noise environment would include increased personnel levels, increased numbers of vehicles, construction, increased air traffic, and missile launches.

While the increase in background noise levels may be dramatic, the lack of any other external noise sources results in only a limited increase in the background noise levels. However, due to the limited contact with off-island noise sources, this limited increase may be perceived as being quite invasive. This may be particularly true of the intense sound levels generated during missile launches.

Construction-related noise would be temporary in nature and occur mostly at the northern and southern ends of the island. Construction-related noise would occur during the daytime hours, and because of the distance from the village on the island, should not affect the island residents. Most of the ma or construction related noise would only last a couple of months during ground disturbing activities. Some of the construction and operation related trucks would utilize the island roads to move equipment from one end of the island to the other however, this should be infrequent, amounting to no more than a couple of trips a week. The diesel generators that would operate some of the facilities proposed for Niihau would operate only when range operations are occurring and would be located so that they would not be heard by island residents in the village.

Under the Proposed Action, there may be up to 1 aircraft operations per year associated with the proposed landing strip. Aircraft would consist of larger propeller or et cargo aircraft. Although noise levels for these types of aircraft can be as high as 1 dBA at 1 2 m (ft), none of the operations would occur near the village on the island. In addition to the aircraft operations, there may be some additional helicopter flights to support TBMD and TMD operations. These operations combined with the No-action helicopter operations would not exceed per year and would not occur near the village on the island.

Under the Proposed Action, two potential launch areas are expected on the Island of Niihau. From these launch areas either target or defensive missiles could be launched. It is expected that no more than four target systems and four defensive missiles would be launched per year. The maximum noise levels are expected to be 1 dBA at 2 1 m (ft), 11 dBA at m (1, ft), 2 dBA at 3, m (12,123 ft), and 82 dBA at 11, 8 m (38,33 ft). The highest noise level expected at the village on the island is 8 dBA. Figure .2.1. -1 provides the expected noise contours from northern and southern launches. None of the noise levels outside of the ground hazard area where non-essential personnel and the public are excluded for these launch locations exceed either DOD or OSHA safety requirements. Personnel within the ground hazard area wear hearing protection devices. Personnel and island residents outside of the ground hazard area may be startled, awakened, or distracted by the launch noise. However, it is expected that all island residents would be informed of a launch prior to it occurring. The potential effects



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EXPLANATION

- Village
- Keep-Out one
- Contour Lines
- Lakes (Playa)
- Dirt Roads
- 82 dBA (11, 8 meters)
- 2 dBA (3, meters)
- 11 dBA (meters)
- 1 dBA (2 1 meters)
- Launch Site

dBA A-weighted Decibel

North

Scale
2.1 .2 Kilometers
1.3 2. Miles

Maximum Launch Noise Contours (dBA) at Niihau, Potential Sites

Niihau, Hawaii

Figure 4.2.1.9-1

niihau ns 1

of atmospheric conditions on noise levels and noise from a flight termination are addressed under section .1.1. , Noise.

Sonic booms generated from launches on Niihau would occur over the open water and would not impact the island. However, targets descending to the ocean near Niihau have the potential to generate sonic booms that may be heard on Niihau. The size, shape, and intensity of the sonic boom will depend on the size and shape of the target, the tra ectory, and the meteorological conditions. Since these details are not known at this time, for the purpose of analysis the Hera missile, which is one of the largest missiles considered in the Proposed Action, will be used as a representative case.

Using the PCBOOM computer model, analysis for the reentry of a Hera missile generated sonic booms with overpressures ranging from 2 to 2 pounds per square foot (psf). The 2 psf contour extended . km (. mi) on each side of the target impact point.

Under the Proposed Action, all target impact points would be more than . km (. mi) from the shores of Niihau therefore, the sonic boom from reentry of a target missile is anticipated to have no impact on Niihau s noise environment. Potential impacts to marine life in general, and marine mammals in the open ocean, in particular, are addressed in section . .2.2.

In terms of the potential for cumulative impacts, the noise environment on Niihau mostly consists of natural noises except the occasional aircraft fly-by or the generators that provide electricity to individual houses on the island. The increased activities would result in up to eight launches per year on the island and the operations associated with these launches. Although PMRF operations would be infrequent on the island, the noise generated under the Proposed Action would involve a new source not normally heard by the island residents. However, given the few expected launch operations and other activities, overall noise levels within the village area and on the entire island are not expected to substantially increase over baseline conditions, with the exception of the short-lived launch noise.

No mitigation measures for noise are proposed.

4.2.1.10 Socioeconomics—Niihau

4.2.1.10.1 No-action Alternative—Socioeconomics, Niihau

The No-action Alternative is characterized by current PMRF operations on Niihau. PMRF leases 3. ha (1,1 ac) on Niihau. The Niihau residents provide security and maintenance support to the PMRF facilities throughout the year. PMRF activities also require use of the Niihau landing barge and helicopter which generate income for the Niihau Ranch. The activities of PMRF personnel, while on Niihau, are strictly controlled by an existing protocol (appendix G). The protocol is intended to limit contact between PMRF personnel and the people of Niihau. The protection protocol (appendix G) is in place between the Navy and Niihau to ensure that Niihau lifestyle, language, and culture are not adversely affected by ongoing Naval activities. Such a protective protocol is consistent with the conclusion that, to survive culturally, Niihau residents must retain enough control to evolve over time without being overwhelmed by outside cultures, conditions, and perceptions (Meyer, 1 8, p.3).

Both the Navy and Niihau express satisfaction with the existing protection protocol. The mitigative challenge is to ensure that, as proposed additional activities on Niihau occur, the protection protocol could be strengthened, if necessary, to maintain assurance of cultural protection for the island.

The island and its near-shore waters are periodically sub ect to unregulated intrusion by off-island fishers, shellfish harvesters and tourists. Such incursions deplete Niihau s subsistence resources and intrude on island privacy, lifestyle, and culture. (Meyer, 1 8, p. 1 -12)

No other activities under the No-action Alternative would add to current activities therefore, no cumulative impacts would occur.

The protection protocol between Niihau and the Navy is reviewed annually, and ad ustments made as required. Such review should continue. No further mitigation measures are required.

4.2.1.10.2 Proposed Action—Socioeconomics, Niihau

Each proposed activity will have a unique potential for positive or negative effect on Niihau. However, given physical mitigation to ensure safety, it will be the cumulative intensity of proposed activities that will principally determine to what extent Niihau will benefit or be threatened.

4.2.1.10.2.1 Employment and Income

Preparation of the launch and instrumentation facilities, construction and upgrading of infrastructure on Niihau, and on-island support for ongoing programs would generate activity of varying intensity. The positive impact of this activity is the employment of Niihau residents in construction and support activities, and revenue support for island infrastructure, particularly in transportation.

Given recent difficulties incurred by Niihau subsistence and economic activities, such economics effects would be substantially beneficial. Under full development of proposed activity scenarios, support servicing would likely provide significant levels of employment for all interested Niihau residents in the Niihau labor pool (Robinson, 1). Transportation-related revenues to Niihau would also increase substantially beyond the present level of approximately , per year. For example, each flight test conducted under the Proposed Action would employ 1 Niihau resident support personnel for 2 weeks and would generate , of additional revenue to Niihau s transportation infrastructure.

4.2.1.10.2.2 Subsistence

Niihau s shoreline subsistence fishing, shellfishing, and shell gathering activities will not be reduced over the long term by the Proposed Action, and the salt ponds at the southern end of the island would not be impacted by launch debris in the event of a flight termination. In consideration of potential impacts to these areas, the Navy has established flight corridors which ensure no potentially hazardous debris or hazardous material would be deposited in these areas from flight termination. Short-term closures of ad acent shoreline may be required during test firing activities. Fishing by off-islanders has been identified by Niihau residents as a cause of depleted fisheries in the Niihau near-shore area (Meyer, 1 8, p. 1 -1). To the extent that Navy security and safety requirements reduce such incursions, Niihau subsistence resources could substantially benefit.

In terms of cumulative impacts, the test program outlined in the EIS begins in 2 and extends through 2 3 , implying a cumulative impact over a 31 year period. The revenues and potential risks identified in this report would extend over that period. Given cumulative trends in Niihau circumstance, revenue and employment, effects of the Proposed Action would substantially reverse adverse economic conditions on the island. Niihau residents have retained their cultural integrity while interfacing with military activity on the island for almost years. If the cultural Protection Protocol is continued, and as necessary, strengthened, Niihau residents should be able to maintain and practice their culture over the 31-year time frame of this proposed program.

In terms of potential mitigation measures, construction and operational impacts on the culture and quality of life of Niihau could be further mitigated by reviewing and strengthening the protection protocol between PMRF and the island. Cultural sensitivity training to off-island personnel who may come into contact with Niihau residents could also be provided.

The number of Niihau residents employed in construction work could be maximized by technical skill training. This training would increase the number of income-earners on the island and reduce the potential for cultural disruption by gradually reducing the non-indigenous workforce.

4.2.1.11 Transportation—Niihau

4.2.1.11.1 No-action Alternative— Transportation, Niihau

Under the No-action Alternative, there would continue to be no paved roads. Transportation services to and from the island would be provided by helicopter and occasional barges.

No cumulative impacts would result from the No-action Alternative.

No mitigation measures for transportation are proposed.

4.2.1.11.2 Proposed Action— Transportation, Niihau

Proposed Action activities would consist of grading and resurfacing of existing roads. Clearing, leveling, and grading of a 1,82 -m (, -ft) airstrip for the increased air traffic would also be done. Impacts as a result of these activities would be positive.

No adverse cumulative impacts are expected.

No mitigation measures for transportation are proposed.

4.2.1.12 Utilities—Niihau

4.2.1.12.1 No-action Alternative— Utilities, Niihau

Under the No-action Alternative, no improvements or upgrades would be performed, and there would continue to be no regular infrastructure on the island.

No cumulative impacts would result from the No-action Alternative.

No mitigation measures for utilities are proposed.

4.2.1.12.2 Proposed Action— Utilities, Niihau

All existing facilities would remain self-contained. Newly constructed facilities would also be self-contained using generator power and portable toilets. No sewage would be disposed of, or left, on the island. Solid waste would be collected and removed from the island. No impacts are expected.

No adverse cumulative impacts are expected.

No mitigation measures for utilities are proposed.

4.2.1.13 Visual and Aesthetic Resources

4.2.1.13.1 No-action Alternative— Visual and Aesthetic Resources, Niihau

Under the No-action Alternative, there would be no change to the visual environment on Niihau. As described in the affected environment, minimal development has occurred on Niihau, and the island presents an uncluttered appearance. Under this alternative, the Paniau radar unit and Perch site would continue to detract from the natural appearance of the surrounding area immediately ad acent to the sites.

Overall, no adverse impacts would occur from implementation of the No-action Alternative.

In terms of the potential for cumulative impacts, although much of the natural vegetation on Niihau has changed because of grazing, the island still represents a relatively undeveloped natural appearance. Because of the minimal development, the cumulative impacts to the visual environment at Niihau have not occurred. No other development that could result in cumulative impacts are expected to occur under the No-action Alternative.

In terms of mitigation measures, aesthetic effects could be minimized by using earth-toned paint on all structures.

4.2.1.13.2 Proposed Action— Visual and Aesthetic Resources, Niihau

Under the Proposed Action, PMRF would continue to operate the existing Paniau radar and Perch sites on Niihau and construct and operate target and interceptor facilities, a 1,82 -m (, -ft) airstrip, telemetry sites (Aerostat and portable communication vans), and improved road access. The Aerostat consists of a balloon approximately m (2 3 ft) long that in use would be approximately 3, 8 to , 2 m (1 , to 1 , ft) above mean sea level.

None of the proposed new facilities except Aerostat would be visible from the village on Niihau. However, construction of the launch and instrumentation (telemetry and radar sites) facilities on Niihau would provide out-of-character elements and would contrast with the existing natural visual environment. These new facilities could be seen by island residents when walking ad acent to the facilities and may obstruct prominent vistas of the surrounding ocean and would detract from what the residents have become accustomed to visually. In addition, some of the facilities would be visible to non-island fishermen, divers, and Niihau Ranch guests and would provide a visual out-of-character element. Because no structures would be associated with the airstrip, it would not be visible except in the immediate vicinity and it would not block any prominent vistas.

When the Aerostat is operating during range activities, it would be tethered to the ground by three cables and would be approximately 3, 8 to , 2 m (1 , to 1 , ft) above mean sea level. This would provide a visual impact similar to a blimp and would be visible from anywhere on the island and surrounding area at ground level. However, while operating, the Aerostat would not block any ground level vistas on the island or surrounding area. When not operating, the Aerostat would be brought back to ground level and tied down. While on the ground, it would continue to provide an out-of-character element, but because of its proposed locations inland, it should not block any prominent vistas of the ocean. Associated with the Aerostat unit would be four portable trailers, a storage facility, diesel generators, and a dual security fence around the perimeter of the Aerostat support equipment.

Overall, no adverse visual impacts would occur from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, although much of the natural vegetation on Niihau has changed as a result of grazing, the island still presents a relatively undeveloped natural appearance. The few new permanent facilities that are planned for the island would contribute to cumulative visual impacts, bringing in a more developed nature to the island especially on the southern and northern ends of the island. Most of the new facilities would not be visible from the island village and would only block prominent vistas if island residents are in the vicinity of the facility. Overall, the addition of facilities under the Proposed Action would increase the number of out-of-character elements to the island of Niihau.

In terms of mitigation measures, aesthetic effects could be minimized by using earth-toned paint on all structures.

4.2.1.14 Water Resources—Niihau

This section describes the potential impacts to water resources on Niihau that could occur from the No-action Alternative and the Proposed Action.

4.2.1.14.1 No-action Alternative— Water Resources, Niihau

No adverse impacts to water resources are expected from the continuation of instrumentation, test vehicle airstrip, and helicopter training activities.

There are no additional activities that have been identified that, when combined with the No-action Alternative, would result in cumulative impacts to water resources at the Niihau site.

No mitigation measures for water resources are proposed.

4.2.1.14.2 Proposed Action— Water Resources, Niihau

Impacts that could result from proposed construction activities at Niihau include increased turbidity contamination of surface waters, and changes in the surface drainage. Impacts could also result from launch-related activities such as changes in water chemistry due to deposition of launch emissions, chemical simulants, and missile debris. Water consumption related to the proposed activities on Niihau would be minimal, primarily for consumption by construction and operations workers, maintenance, and for fire fighting. Water for these types of activities would be barged to Niihau with no impacts on island resources. Past surveys of Niihau suggest that fresh groundwater resources are extremely limited, with high salinity being common. There are no plans to depend on island water resources. However, the proposed airstrip could serve as a catchment system depending on how it is built. Catchment water could be treated for drinking water as well as for other uses.

4.2.1.14.2.1 Construction Activities

Construction activities at potential launch sites, instrumentation sites, and Aerostat sites on Niihau would involve routine construction activities including earthwork, concrete forming and working, small building construction, and road upgrades. These operations are routinely accomplished in both military and civilian construction operations, and would follow standard engineering techniques to control erosion. Surface drainage would not be substantially modified.

Construction of a 1,82 -m (, -ft) airstrip would involve routine construction activities as described above. The airstrip would be located so as to minimize cut and fill and changes to the existing surface drainage. The surface of the airstrip would be either dirt or hard-surface (i.e., concrete), or campaign-type metal landing mats with neoprene liners.

In accordance with the NPDES program requirements, a ~~G~~general NPDES permit would be required for construction activities which result in the disturbance of 2 or more hectares (or more acres) of land. Construction activities for two target launch sites would result in a disturbance of approximately . ha (1. ac) of land, a telemetry/instrumentation site approximately .2 ha (. ac), and an Aerostat site approximately . ha (1. ac). Assuming two target launch sites, four telemetry/instrumentation sites, and one Aerostat site, a total of 2. ha (. ac) would be disturbed and would be sub ect to NPDES permitting requirements. The airstrip construction would result in disturbance of approximately . 8ha (13.8 ac) and would be sub ect to NPDES permitting.

4.2.1.14.2.2 Flight Test Activities

Surface Water

Impacts to surface waters within the Niihau region of influence would be primarily associated with the deposition of combustion emissions in near-shore ocean waters. Combustion emissions of liquid-fuel missiles such as the Lance consist primarily of water vapor, nitrogen gas, and carbon monoxide. Therefore, liquid-fuel missile exhaust components will have no impact on surface water quality. The ma or combustion emissions of solid-fuel missiles such as the Patriot-as-a-Target (PAAT) include aluminum oxide, carbon monoxide, water vapor, hydrogen chloride, and nitrogen gas. Of these, only aluminum oxide and hydrogen chloride have the potential to deposit into the local surface waters. Aluminum oxide is a relatively non-reactive solid that could deposit in a dust-like form. Hydrogen chloride, while soluble in water, does not readily deposit as a dry aerosol onto dry surfaces. Under conditions of less than 1 relative humidity, dry deposition of hydrogen chloride is anticipated to be insignificant.

The total masses emitted from a representative target missile (PAAT) are 18 kg (lb) aluminum oxide and 1 kg (18 lb) hydrogen chloride. Applicable studies have been made regarding deposition of exhaust products in seawater due to the launch of the Space Shuttle. The motor studied is the Shuttle s Advanced Solid Rocket Motor (ASRM) booster, which emits in excess of times the exhaust components of the PAAT. (National Aeronautics and Space Administration, 1 , Aug, p. -1). The ASRM is not proposed for use onNiihau and its 1
mention here is only as a point of reference. The ASRM also produces a significantly larger ground cloud and therefore impacts a larger area than the proposed TMD missiles. The emission concentrations at any point would also be expected to be lower for the proposed TMD than those of the ASRM. This would also lead toless impacts from the proposed TMD missile launches.

The assessment of ASRM emissions concluded that effects to general water quality are expected to be not significant. In addition, hydrogen chloride would be expected to disperse quickly and be diluted and neutralized by the natural buffering capacity of the sea. Aluminum oxide is essentially insoluble in water and does not seem to have an appreciable toxicity for aquatic organisms (National Aeronautics and Space Administration, 1 3, Jul, p.). 3

Impacts to water resources could also occur from excess solid rocket motor (SRM) propellants following a flight termination. SRM propellants are composed primarily of a fuel element, an oxidizer, and a binder which holds the fuel and oxidizer together in solid form. TheSRMs proposed for use in both the interceptor and target missiles would consist primarily of ammonium perchlorate (AP) and a polybutadiene rubber (HTPB) binder. The primary issue of concern is the aqueous leaching of AP from an SRM propellant. The dissolution of AP when in an HTPB binder would be minimal because the binder is

hydrophobic. Although fractured areas of the SRM would allow for the penetration of water molecules and the dissolution of AP, penetration beyond the fracture areas would be extremely slow due to the hydrophobic characteristics of the binder (Kataoka, 1 , Jun). 3
Studies prepared on behalf of the Air Force have confirmed that a slow dissolution (leaching) of AP occurs when in the form of a solid propellant with an HTPB rubber binding agent (U.S. Air Force, 1 8 , Oct, p.2 Air Force Wright Aeronautical Laboratories, 1 8 , Oct, p.22 through 12 , 1 3).

Although no environmental studies have been identified which specifically evaluate the fate of AP in a marine environment, information can be obtained from various studies to determine the predicted changes in marine water chemistry and toxicity levels. For example, a study prepared on behalf of the Department of Public Sanitation of Moscow, Russia, concluded that AP (within a water environment) does not substantially affect the biochemical consumption of oxygen, nor the processes of growth among saprophyticmicroflora (Moscow Department of Public Sanitation, 1 , 2 Sep, p.3 through). Additional studies providefindings which indicate that AP would not result in significant changes in pH and nitrogen levels (U.S. Air Force, 1 83 Alcorn State University, 1 , 1 Jun). Based on the findings of these studies, AP 123, 2
would not result in appreciable changes in marine water chemistry (i.e., pH, Biological Oxygen Demand (BOD), and nitrogen levels). In addition, changes in chloride levels resulting from AP deposition in seawater would not be significant in nature (Boyer, 1 , Jul). 1

Because the HTPB binding agent is essentially insoluble in water and does not seem to have an appreciable toxicity for aquatic organisms, concerns regarding increased toxicity levels would be primarily associated with that of AP. However, any AP leaching from the binding agent would disperse quickly and would be diluted and neutralized by the natural buffering capacity of the sea. Even in the most conservative analysis involving the impact of a fully loaded vehicle in the ocean environment, the volume of AP involved is small and the effects are not considered persistent. As a result, potentially toxic concentrations within more than a few meters of the propellant would not be anticipated (National Aeronautics and Space Administration, 1 3, Jul, p.3 Kataoka, 1). 3, 3

Missile hardware consists of materials used in missile assembly. The corrosion of these materials within an aqueous environment would contribute various metal ions to the surrounding environment. In ma or part, such hardware consists of aluminum, steel, plastics, fiber-reinforced plastics, and electronic components. A large number of different compounds and elements are used in small amounts in rocket vehicles and payloads for example, lead and tin in soldered electrical connections, silver in silver-soldered oints, cadmium from cadmium-plated steel fittings, and copper from wiring. The rate of corrosion of such materials is slow in comparison to the mixing and dilution rates in the water environment, and hence, toxic concentrations of metal ions will not result. The miscellaneous materials (e.g., battery electrolytes) are present in such small quantities that only extremely localized and temporary effects would be anticipated.

Groundwater

As mentioned in section 3.2.1.1 , groundwater resources located within the Niihau region of influence occur within beach sand, calcareous dunes, alluvium, eolianite, and the Kiekie and Paniau volcanic series. Potable groundwater within the region of influence is very limited. Measurable groundwater contamination as a result of launch activities is highly unlikely because of the limited quantities of missile exhaust emissions that would reach the ground, and the standard spill prevention, containment, and transportation safety plans that would be implemented.

In terms of the potential for cumulative impacts, direct and indirect impacts to water resources are not expected to result in substantial long-term changes in water chemistry, degradation of potable water sources, or substantially diminished aquatic habitat value. No other activities have been identified at Niihau that, when combined with the Proposed Action, would result in cumulative impacts to water resources.

No mitigation measures are proposed however, the airstrip with a concrete or metal surface with neoprene liners could provide a significant watercatchment system.

4.2.2 KAULA

4.2.2.1 Airspace—Kaula

4.2.2.1.1 No-action Alternative— Airspace, Kaula

4.2.2.1.1.1 Controlled and Uncontrolled Airspace

The ongoing, continuing gunnery exercises at Kaula would have no impact on controlled and uncontrolled airspace.

4.2.2.1.1.2 Special Use Airspace

The ongoing, continuing gunnery exercises at Kaula would have no impact on special use airspace. Restricted Area R-31 and the surrounding Warning Area W18 were specifically designed to accommodate these kinds of hazards to non-participants activities.

4.2.2.1.1.3 En Route Airways and Jet Routes

The ongoing, continuing gunnery exercises at Kaula would have no impact on en route airways or et routes. The closest airway, V1 , lies some 33 km (18 nmi) to the north of Kaula.

4.2.2.1.1.4 Airports and Airfields

The ongoing, continuing gunnery exercises at Kaula would have no impact on airports and airfields.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.2.2.1.2 Proposed Action— Airspace, Kaula

The Proposed Action would not change the level or intensity of gunnery exercises at Kaula. Consequently, the airspace use impacts would be essentially identical to those under the No-action Alternative.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.2.2.2 Biological Resources—Kaula

4.2.2.2.1 No-action Alternative— Biological Resources, Kaula

4.2.2.2.1.1 Operations

Gunnery Training

Under the No-action Alternative, current gunnery training activities would continue. Under the Endangered Species Act Section consultation process, the Navy has agreed to mitigations that reduce or eliminate any potential impacts to the humpback whale. Some individual migratory seabirds may be lost to gunnery training activities in the designated impact area. Gunnery rounds that may occasionally miss the designated impact area may also result in the loss of a few individuals. ~~However,~~ While the impacts on the populations of these species are expected to be minimal, ~~since~~ the populations appear to be healthy and reproducing normally (U.S. Department of the Navy, 1 8 , 2 Feb, p. - , Appendix F).~~;~~ T~~t~~hese colonies are not regularly monitored, and the impacts of past bombing have not been studied. 1 3

No cumulative impacts to terrestrial or marine wildlife are expected under the continuing actions of the No-action Alternative.

Mitigations agreed to by the Navy and the NMFS to reduce and/or eliminate impacts to the endangered marine mammal include seasonal use during periods when the marine mammals are not present, surveying the waters off of the island to be sure no marine mammals are present, and having an impact area on the south end of the island only. In addition, the Navy, in consultation with USFWS and NMFS, will develop monitoring plans appropriate for Kaula that include participation of appropriate Navy EOD personnel.

4.2.2.2.2 Proposed Action— Biological Resources, Kaula

Under the Proposed Action, no increase in activities at Kaula are proposed. Therefore, impacts would be similar to those under the No-action Alternative and are not expected to be significant.

Cumulative impacts would be the same as described for the No-action Alternative.

Mitigation measures would be the same as described under the No-action Alternative.

4.2.2.3 Cultural Resources—Kaula

A survey of Kaula was conducted by a State of Hawaii archaeologist in 1 . No evidence was found of extensive human habitation on Kaula (U.S. Department of Defense, 1 ,1 Jul, p.D-2). There are no sites on Kaula that have been listed in either the State of Hawaii or National 1
Register of Historic Places as defined in EO 11 3, *Protection and Enhancement of the Cultural Environment* (U.S. Department of the Navy, 1 8 , 2 Feb, p.). 1 3

4.2.2.3.1 No-action Alternative— Cultural Resources, Kaula

Currently, ha (1 ac) at the southern tip of Kaula are regularly used to conduct helicopter gunnery practice. These activities would continue to be practiced under the No-action Alternative.

~~In terms of the potential for cumulative impacts, ~~S~~s~~ince gunnery practice is confined to the southern tip of the island, no cumulative impacts to cultural resources would be incurred as a result of implementation of the No-action Alternative.

No mitigation measures for cultural resources are proposed.

4.2.2.3.2 Proposed Action— Cultural Resources, Kaula

No increase in activities at Kaula are proposed for the PMRF Enhanced Capabilities. Impacts would be the same as the No-action Alternative.

Cumulative impacts for the Proposed Action would be the same as that for the No-action Alternative.

No mitigation measures for cultural resources are proposed.

4.2.2.4 Geology and Soils—Kaula

4.2.2.4.1 No-action Alternative— Geology and Soils, Kaula

The No-action Alternative is the continued use of the southeast end of Kaula ~~island~~ to train aviators in air-to-surface weapons delivery. Authorized ordnance includes gunnery rounds. Permanent adverse soil and geologic effects have been noted by the Navy resulting from shattering of rocks in explosions and the possibility of inert ordnance (duds) which may remain in the target area (U.S. Department of the Navy, 1 8 , 2 Feb, p.). The Navy minimizes the 1 3
impact by managing the targeting to the distal southeast tip of the island, approximately 8 percent of the total land mass (U.S. Department of the Navy, 1 8 , 2 Feb, p.). 1 3

~~Environmentally, ~~B~~b~~ecause Kaula is ~~volcanic in origin,~~ arid, relatively barren, and composed of steep inclines with little soil cover, the use of a portion of the island for target practice does not cause as much damage as opposed to using a flatter, more fertile area elsewhere. Damage is generally limited to the target area. ~~As there is minimal soil on the slopes, potential additional erosion caused by past bombardment and gunnery exercises is minimal.~~ Present use of the island does not preclude use for another purpose in the future (U.S. Department of the Navy, 1 8 , 2 Feb, p.). 1 3

No other activities that could result in cumulative impacts have been identified. The continued use of the island for Naval target practice would not result in cumulative geology and soil impacts.

No mitigation measures for geology and soils are proposed.

4.2.2.4.2 Proposed Action— Geology and Soils, Kaula

Impacts under the Proposed Action would be the same as those described for the No-action Alternative.

Impacts from past activities would remain however, no new adverse impacts are expected from the continued use of Kaula as a gunnery training range. Cumulative impacts would be the same as those described for the No-action Alternative.

No mitigation measures for geology and soils are proposed.

4.2.2.5 Health and Safety—Kaula

4.2.2.5.1 No-action Alternative— Health and Safety, Kaula

Under the No-action Alternative, the Navy would continue to use Kaula ~~Island~~ for gunnery practice operations. To minimize health and safety risks, the Navy has established a Surface Danger one around the island and has closed the island and surrounding tidal zone to unauthorized personnel. In addition, prior to any gunnery operations, an aircraft flies over the island and determines if it is safe to conduct the mission. Because of the establishment of these safety procedures, there are no adverse public health and safety risks.

~~In terms of the potential for cumulative impacts, n~~No other activities that could add to potential cumulative impacts occur within the region of influence, and public access is restricted therefore, there are no cumulative public health and safety risks associated with continued use of Kaula.

No mitigation measures for health and safety are proposed.

4.2.2.5.2 Proposed Action— Health and Safety, Kaula

Under the Proposed Action, Kaula would continue to be used in a similar way to the No-action Alternative. Impacts would be the same as described under the No-action Alternative.

Cumulative impacts would be as described for the No-action Alternative.

No mitigation measures for health and safety are proposed.

4.2.2.6 Land Use—Kaula

4.2.2.6.1 No-action Alternative— Land Use, Kaula

4.2.2.6.1.1 Land Use

Under the No-action Alternative, approximately ha (1 ac) of the -ha (1 8-ac) island of Kaula would continue to be used for aircraft gunnery practice. Although the island has been used by the Navy for these types of operations, the State of Hawaii has designated the island a seabird sanctuary. The open undeveloped use of the island is compatible with the Navy gunnery practice activities. The State has included the island within the conservation protective subzone use designation which would limit any development on the island. This use of a portion of the island for gunnery practice is compatible with the State conservation designation. Potential impacts to bird species from gunnery practice are addressed under biological resources.

The continuation of activities at Kaula under the No-action Alternative would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. The operation of the site does not affect any recreational opportunities or historic or prehistoric resources. The Navy has consulted with the USFWS to minimize impacts to biological resources. As public access to Kaula is restricted, no visual resources are affected.

4.2.2.6.1.2 Recreation

Under the No-action Alternative, access to Kaula would continue to be restricted for safety purposes. The only recreational activity allowed in the area is when the Navy allows fishing within the danger zone on weekends. The Navy would continue to allow fishing under the No-action Alternative. No other recreational opportunities are affected.

Overall, there are no adverse impacts to land use from implementation of the No-action Alternative.

In terms of the potential for cumulative impacts, no other land use designations or changes have occurred on the island except for the introduction of Navy gunnery practice, and no future changes are anticipated. Therefore, no cumulative impacts are expected. Because of the isolation of the island and distance from the main Hawaiian Islands, recreation has not been a use on Kaula, and there are many other areas which can provide the same type of recreation. The Navy s continued use of the island would not represent a cumulative impact to recreation in the Hawaiian Islands.

No mitigation measures for land use and recreation are proposed.

4.2.2.6.2 Proposed Action— Land Use, Kaula

Under the Proposed Action, Kaula would continue to be used similar to the No-action Alternative. Impacts would be the same as described under the No-action Alternative.

Cumulative impacts would be as described for the No-action Alternative.

No mitigation measures for land use and recreation are proposed.

4.2.2.7 Water Resources—Kaula

This section describes the potential impacts to water resources on Kaula that could occur from the No-action Alternative and the Proposed Action.

4.2.2.7.1 No-action Alternative— Water Resources, Kaula

Kaula is an uninhabited, rocky islet with no information relative to water resources. Helicopter gunnery practice could impact the southern ha (1 ac) of Kaula, but no known water resources (streams, lakes or groundwater) are in the area.

In terms of the potential for cumulative impacts, no activities have been identified that, when combined with the No-action Alternative, would result in cumulative impacts to water resources.

No mitigation measures for water resources are proposed.

4.2.2.7.2 Proposed Action— Water Resources, Kaula

No additional activities, beyond those identified in the No-action Alternative, are planned for Kaula.

In terms of the potential for cumulative impacts, no activities have been identified that, when combined with the No-action Alternative, would result in cumulative impacts to water resources.

No mitigation measures for water resources are proposed.

4.2.3 MOUNT HALEAKALA TRACKING FACILITIES

Activities at this site under both the No-action Alternative and the Proposed Action would consist of continued operations with no site modifications. Review of operations determined that no environmental impacts would occur from site activities. Appendix D provides an overview of the environmental resource determination for this site.

4.2.4 KAENA POINT

Activities at this site under both the No-action Alternative and the Proposed Action would consist of continued operations with no site modifications. Review of operations determined that no environmental impacts would occur from site activities. Appendix D provides an overview of the environmental resource determination for this site.

4.2.5 WHEELER NETWORK SEGMENT CONTROL/PMRF COMMUNICATION SITES

Activities at these sites under both the No-action Alternative and the Proposed Action would consist of continued operations with no site modifications. Review of operations determined that no environmental impacts would occur from site activities. Appendix D provides an overview of the environmental resource determination for this site.

4.2.6 DOE COMMUNICATION SITES

Activities at these sites under both the No-action Alternative and the Proposed Action would consist of continued operations with no site modifications. Review of operations determined that no environmental impacts would occur from site activities. Appendix D provides an overview of the environmental resource determination for this site.

4.3 CANDIDATE SITES

During the preparation of the ~~D~~EIS, data has been collected and analyzed in order to evaluate the impacts of the No-action Alternative at proposed candidate sites.

4.3.1 TERN ISLAND

Although Tern Island was originally a site alternative in the Draft EIS, the Navy has determined that it is not a reasonable alternative and therefore has been eliminated as a proposed site in this EIS. Review of the existing data available for Tern Island to support the assessment of the environmental effects of the Proposed Action at Tern Island, coupled with the comments received from government agencies and from the public, has led the Navy to eliminate Tern Island as a Proposed Action site. The discussion and analysis on Tern Island have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Tern Island is no longer a reasonable alternative takes precedence over these other discussions concerning Tern Island in this EIS.

4.3.1.1 Air Quality— Tern Island

4.3.1.1.1 No-action Alternative— Air Quality, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on air quality. Electrical power on the island is provided by solar-powered cells with generators used only for backup. Any generator emissions would be minor and quickly dispersed by the prevailing tradewinds.

No cumulative impacts would occur for the No-action Alternative on Tern Island.

No mitigation measures for air quality are required.

4.3.1.1.2 Proposed Action— Air Quality, Tern Island

Tern Island is a potential target missile launch site sub ect to a USFWS compatibility determination. As such, its local air quality could be impacted by site preparation activities, launch support activities, and missile launch activities.

Construction emissions would include fugitive dust, diesel exhaust emissions, and minimal amounts of VOCs. Specific levels of each of these would depend upon specific actions, duration of construction, land area disturbed, and number of vehicles involved. However, based on a construction site size of approximately . ha (1. ac), PM and PM-1 generation is not anticipated to exceed 1,81 kg (2 tons) per month and kg (1 ton) per month, respectively. Construction activities would not be anticipated to causeexceedances of NAAQS or health-based guidance levels.

Launch support activities that could potentially impact air quality include target missile transportation and preparation for launch, and power generation. Pollutants generated due to these activities would be minimal in nature. Emissions would be intermittent with specific amounts dependent upon the required level of activity. Predominant local weather conditions would tend to rapidly disperse emissions. Due to anticipated level and type of emissions, the remoteness of the site, the lack of other local pollution emissions, the lack of accessibility to the public, and prevalent weather conditions, no impacts to air quality would be anticipated due to the proposed launch support activities.

Air quality impacts due to missile launches can be expected to be similar to those presented in section .1.1.1. Specifically, a launch would potentially result in short-termexceedances to health-based guidance levels within the ground hazard area and launch hazard area. However, access to this area is controlled by PMRF range safety practices, and the public would not have access in any case. These short-term impacts would return to normal in a matter of hours at the most. As such, no impacts would be anticipated due to actual missile launch activities.

In terms of the potential for cumulative impacts, the only other local source of air pollution at Tern Island is the burning of refuse related to the permanent monitoring camp. Even though emissions from this activity are expected to be minimal, there is potential for a cumulative impact to air quality if launch operations are conducted at the same time as the burning.

No mitigation measures for air quality are proposed.

4.3.1.2 Airspace— Tern Island

4.3.1.2.1 No-action Alternative— Airspace, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on airspace.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.3.1.2.2 Proposed Action— Airspace, Tern Island

The proposed pre-test flight site modification or construction activities, the land-based operations and training, and base operations and maintenance activities on Tern Island would have no impact on airspace use. Test flight operations, however, do have the potential for impacts to airspace use. These potential impacts are discussed in section . .1.1 because Tern Island lies in the Ocean Area airspace use region of influence.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.3.1.3 Biological Resources— Tern Island

4.3.1.3.1 No-action Alternative— Biological Resources, Tern Island

No PMRF activities would take place at Tern Island under the No-action Alternative therefore, no impacts would occur. Under the No-action Alternative, the USFWS and NMFS would continue their caretaker and research activities on Tern Island with minimal impacts to seabirds, monk seals, and green sea turtles. The short-term transient noise from the 18 aircraft and ~~18~~ the 8 to 1 sea-going vessel visits per year, given the background wind noise levels at Tern Island, would have no adverse impact to biological resources.

Ongoing USFWS and NMFS activities would not contribute to any biological resources impacts from past activities at Tern Island, or from the scheduled cleanup of contaminants identified in section .3.1. .1.

Potential contaminants that may be leaching into the marine environment include heavy metal, PCBs, dioxins, and petroleum hydrocarbons. The U.S. Coast Guard has voluntarily agreed to remove the marine debris and to conduct additional investigations tocharacterized the debris still buried behind the seawall. They have also agreed to take up to 2 marine sediment samples before and after the marine debris removal and to correlate this sampling with the collection of marine tissues proposed in this study. The U.S. Coast Guard plans to remove the marine debris in September 1 8. The Service is currently completing the Service Contaminant Assessment Process (CAP) Manual for Tern Island that will identify all potential sources of contamination on the island. (Poetter, 1 88, p. 2) 88

This cleanup pro ect proposes to collect tissue samples from marine organisms around Tern Island and a control site located in a clean area of the same atoll. Sampling will be done in Spring 1 8, before the marine debris removal in September 1 8, and afterwards in Spring 1 . Results from U.S. Coast Guard marine sediment sampling will be correlated with tissue data. This data will allow the Service to determine (1) if contaminants are being incorporated by marine organisms and posing a risk of lethal andsublethal effects to marine organisms and posing a risk of lethal and sublethal effects to marine organisms and the threatened and endangered species that feed upon them, and (2) if the U.S. Coast Guard cleanup of marine debris in 1 8 has removed the source of any contamination detected in marine tissues during year 1 of the study. If high levels of contamination in marine tissues are detected in year 1 and they persist after the marine debris is removed, this will indicate a need for further remedial actions. (Poetter, 1 88, p.2) 88

No mitigation measures for biological resources are proposed.

4.3.1.3.2 Proposed Action— Biological Resources, Tern Island

The entire French Frigate Shoals, including Tern Island, is environmentally sensitive and is critical habitat for the Hawaiian monk seal. The island is also important as a nesting, foraging, and basking habitat for sea turtles. Large populations of birds nest in the vegetated areas of the island, although seabird nesting is not limited to vegetated areas, and the south beach of the island is a ~~primary~~ pupping area for monk seals.

4.3.1.3.2.1 Construction

Terrestrial and marine biological resources at Tern Island may experience impacts resulting from the Proposed Action. Removal of some habitat and physical disturbance of nesting seabirds and migratory shore birds during construction of launch pad(s) totaling an area of approximately . x . m (1 x1 ft) around the 18.3x2 . m (x ft) launch pad base (see section 2.3. .3) are expected to cause an impact. Construction-related noise is expected to disturb the Hawaiian monk seals in areas close to the construction site, depending on the site s proximity to the monk seal use area. The increased noise, in con unction with the increased presence of, and activity by, humans (construction workers and pro ect technical advisors), could also have an adverse impact on the seals present in the area. Mitigations defined in the Draft Environmental Assessment for the Proposed Tern Island Shore Protection Pro ect (appendix M) would be adopted to reduce those impacts. ~~Although some individual birds may be killed through collisions with aircraft, the impact on their populations and the species would be negligible because the use of aircraft for construction supply will be limited.~~ Bird strikes on communication and other instrumentation antennas are a potentiallonger term impact, but it is expected to be infrequent. Green sea turtles basking or nesting in areas close to construction could be disturbed by the noise and activity by workers.

Dredging to provide added surface area to the island for construction of launch facilities, and to increase depth of current channels to allow the MATSS and the tugboat access to the southeast end of the island would increase turbidity in the lagoon. Increases in turbidity may increase the presence of the microscopic algae *Cigutera* and therefore the incidence of ciguatoxins in the fish in the vicinity of Tern Island. There is some indication thatciguatoxins adversely affect monk seals (Marine Mammal Commission, Jul, 1 , p.). Because the 2
dredging activity would be localized, the potential impact of the dredging is not ~~expected to eopardize~~ anticipated to adversely affect the survival of the species.

Dredging activities may cause localized damage to the coral reef ad acent to Tern Island. The impact of this localized damage to the reef is expected to be negligible, although a small area may be covered with fill to expand the surface area of the island. To minimize potential adverse effects, biological and geological studies would precede any dredging activities and mitigation could be developed and implemented in consultation with USFWS.

4.3.1.3.2.2 Operations

Disturbance to nesting seabirds and migratory shorebirds during launch operations would be primarily due to the startle effect of the launch noise described in section .3.1. .2. In addition to the impulse noise associated with missile launches, 1 dBA at 8 m (1 ft), noise from the diesel engine of the MATSS tug and operation of the generators onboard the MATSS itself would also add to the disturbance of nesting seabirds and migratory shorebirds. Assuming a 3, hp engine for the tug, the noise generated by the intake, exhaust, and casing radiation is estimated to be dB at a distance of 1 m (ft). Generators, depending on the individual manufacturer and model, could be expected to generate noise levels of between 1 and 82 dBA at 1 m (ft) (see section .3.1.).

The impacts of noise on wildlife in general, and birds in particular, is not well understood. Direct physiological effects of noise on wildlife are difficult to measure and although the processes may be understood, they do not indicate the individual s health or chances of survival. The literature contains a preponderance of small, disconnected, and anecdotal or correlational studies as opposed to coherent programs of controlled experiments. (Larkin, 1 , p. 1)

The effects of noise are partly based on the timing of sounds. Continuous noise lasts for a long time without interruption, whereas impulse noise has a short duration. Evidence is accumulating that impulse and continuous noise differ both in their potential physical effects (namely, hearing damage) and in their sensory-mediated physiological and behavioral effects (Larkin, 1 , p.1). The propagation of sound in natural environments is difficult to measure. Natural ambient noise such as wind noise can presumably mask or otherwise reduce the effect of human produced noise however, in some cases wind noise can mask gradual increase of noise such as approaching aircraft (or tugs), thereby converting gradual onset sound into rapid onset sound capable of startling (Larkin, 1 , p. 1)

Generalizations across taxonomic boundaries are also fraught with difficulties. It is not safe to make predictions about hearing thresholds of a particular species based on data from another species (Larkin, 1 , p. 21) Habituation, or learned responses to noise, is another factor that complicates attempts to describe the impacts of noise. More predictable sources of disturbance (tug diesel noise and generator noise) can lead to greater apparent habituation in field situations than less predictable ones (missile launch noise).

To compound matters, susceptibility to noise seems to be a function of the diel (2 -hour cycle), season, and life history of wildlife. Differing effects of noise on wildlife may be expected at different times. Season and the reproductive cycle also affect acoustically mediated behavior. On a longer time scale the development of individual species must always be considered, where different species may have different critical periods where they maybe more susceptible to noise.

Noise effects on individual animals and birds may include stress and other general physiological effects, including noise-induced hearing loss, either Permanent Threshold Shift life-long hearing loss or TTS, a hearing loss that improves with time. However, other than speculation that continuous or repetitive loud noise may cause metabolic stress and vascular alteration to the inner ear, dose response and other information on which to draw firm conclusions about this relationship are presently lacking (Larkin, 1 , p 28).

Behavioral effects that might decrease chances of surviving and reproducing include retreat from favorable habitat near noise sources and reduction of time spent feeding, with resulting energy depletion, but again the literature is disconnected, anecdotal, and inconclusive (Larkin, 1 , p.3 through 2).

The increased presence of humans (technical personnel) may also cause some disturbance to the nesting seabirds and migratory shorebirds. The wedge-tailed shearwater and Bonin petrels, which nest in sandy burrows, are susceptible to being crushed or buried by inattentive personnel and construction activities. However, the impacts to these species to launches and related launch activities is expected to be low. The potential for bird strike impacts during launch is low, and the impact magnitude is expected to be negligible. The potential effects of airborne contaminants from burning fuels similar to those to be used on Tern Island have been addressed in detail in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p. -23 through -2). Because of the discrete, short-term nature of the 13 releases of burned fuel and the trade winds, the contaminants would be rapidly dispersed with negligible impacts to the wildlife in the area. By implementing restrictions on beach access by personnel, potential impacts to green sea turtles would be reduced to a negligible level.

The sea turtles are not expected to be affected by the launch noise. Launch noise could impact Hawaiian monk seals by startling them and causing them to flee into the water. This could in ure pups, and put adults, pups, and uveniles at risk to shark predation. The effects of noise on monk seals hauled out on islands downrange but within the area affected by sonic booms can be expected to be similar to that near the launch site. The potential effects of noise on the population at Tern Island could result in high magnitude impacts on the monk seal. However, with the limited number of launch events (four per year) and the short-term nature of the events, the species is not expected to be eopardized. With implementation of restrictions on the access of pro ect personnel to the beach areas used by the monk seal, impacts due to increased human activity on the island should be minimized and result in a negligible impact on the monk seal for that aspect of the Proposed Action. The potential impacts of unburned solid propellants that fall into the ocean in the event of an early flight termination are similar to those discussed for Niihau in section .2.1.3.2.2.

The potential impacts of missile and target launches on biological resources at launch sites and in the ground hazard areas surrounding a launch site have been evaluated in detail in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p. -3 through -3). These impacts have been summarized in section .1.1.3.1.1, Land-Based 13 Training and Operations. With adequate fire suppression and given the non-native character of the vegetation near the proposed locations, few potential impacts would occur from fires started by early launch termination. The increased presence of humans (technical personnel) at the launch sites and at the instrumentation sites would be a negligible impact since they would be restricted to staying within the sites to which they are assigned.

Because of the small size of Tern Island, a substantial portion of the island s haul-out beaches would be within the launch hazard area and in close proximity to the launch area. If seals were displaced from Tern Island by the proposed construction activities and the increased presence of humans, their return could be deterred by the periodic launch activities and launch related activities, including noise, exhaust emissions, ground vibrations, and bright lights from missile launches. Moreover, these activities may force monk seals into the water, and several such events per year would result in the possibility of some mortality as a result of shark predation. In addition, if the mostly adult and sub-adult monk seals are displaced from Tern Island, the number of adult males at pupping beaches on East, Trig, and Whaleskate Islands could increase. This could increase the incidence of male aggression towards pups and create a further obstacle to recovery of the atoll s seal colony. As such, there is the potential for adverse impacts to monk seals, although the Proposed Action is not anticipated to adversely affect the Hawaiian monk seal population.

In terms of the potential for cumulative impacts, since no other programs or development activities are planned or ongoing at Tern Island, no cumulative impacts to biological resources are expected as a result of the Proposed Action. No additional plane landings and takeoffs as a result of the Proposed Action would occur at Tern Island, over and above the current USFWS flights. Program personnel would be brought in on the MATSS.

Sea turtles coming on shore to nest or hatchlings leaving the nest could potentially be affected by lighting required for nighttime pre-launch activities. At this time, it is not known what, if any, lighting would be required for support of the proposed launch activities. If lighting is determined to be a necessity, it will be kept to the absolute minimum required and will consist of low pressure sodium lights directed and/or shielded so as not to be visible from the beach. All construction plans, or subsequent requests for lighting will be reviewed and coordinated with the NMFS to ensure potential impacts to sea turtles are minimized to the maximum extent possible.

Possible mitigation measures to help alleviate noise and disturbance impacts to the Hawaiian monk seal would be developed in close consultation with the NMFS and USFWS, and mitigations defined in the Draft Environmental Assessment for the Proposed Tern Island Shore Protection Pro ect (appendix M) would be adopted if, and when, it is determined that the fall-back option of launching missiles out of Tern Island will be exercised, and as specific plans for construction are developed.

~~Mitigation~~ Potential mitigation measures to reduce potential impacts to biological resources at Tern Island could include the following:

- Restricting program personnel from the beach areas
- Scheduling launch activities during the period with the fewest pups and uveniles present, when possible
- Providing light shields to reduce potential effects on birds and sea turtles
- Minimizing the use of heavy-equipment in construction activities on the island
- Using MATSS for all support activities, bringing necessary power and other requirements through cables from MATSS to the launch site

- Following USFWS established procedures for preventing the introduction of alien species
- Using mobile launchers rather than building a concrete launch pad
- Conducting biological and geological surveys prior to dredging
- Scheduling construction and launch activities as defined in the Draft Environmental Assessment for the Proposed Tern Island Shore Protection Pro ect(appendix M) to avoid seasonal turtle nesting.

Prior to a decision to use Tern Island, a compatible use determinationwould be completed by the USFWS and prior to any launches from Tern Island, the Navy would apply for an incidental take permit. Mitigations defined in Draft Environmental Assessment for the Proposed Tern Island Shore Protection Pro ect (appendix M) would be adopted, and if necessary, NEPA analysis would also be conducted for dredging activities at Tern Island.

4.3.1.4 Cultural Resources— Tern Island

Most of Tern Island is an artificial geologic construct that was built by the U.S. Navy in support of the Allied Pacific theater operations during World War II. It would, therefore, be potentially significant in terms of its engineering uniqueness and its role in the history of World War II.

Tern Island is not known to be a traditional cultural property and is devoid of any pre-World War II cultural materials.

4.3.1.4.1 No-action Alternative— Cultural Resources, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on potential historic cultural resources.

No cumulative impacts would occur as a result of the No-action Alternative.

No mitigation measures for cultural resources are proposed.

4.3.1.4.2 Proposed Action— Cultural Resources, Tern Island

Under the Proposed Action, Tern Island would be used for target launches and instrumentation. A launch site with instrumentation for radar, telemetry, optics, electronic warfare, DGPS systems, and communications, command, and control facilities could be placed on either the MATSS or Tern Island as part of the Proposed Action.

Since this pro ect s implementation would not involve any kind of extensive ground disturbances and no cultural resources were observed or known to exist on the island, no impacts to cultural resources are anticipated.

No cumulative impacts to cultural resources as a result of the Proposed Action are anticipated.

In terms of mitigation measures, no cultural resources are known to exist on Tern Island. Therefore, no mitigation measures for cultural resources are proposed. However, in compliance with the NHPA Section 1 review and comment process and the ACHP s regulations implementing Section 1 (3 CFR 8), PMRF would consult with the Hawaii SHPO, the ACHP, and USFWS to address any cultural resource issues that could compromise the island s potential historic significance as a result of PMRF s Proposed Action.

4.3.1.5 Geology and Soils— Tern Island

The physical structure or chemical composition of soils and rock underlying Tern Island could potentially be affected by construction and/or launch activities. The region of influence for this resource includes the land at Tern Island identified for potential new construction, and ground hazard areas associated with proposed launch facilities.

4.3.1.5.1 No-action Alternative— Geology and Soils, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on geology and soils.

No cumulative impacts would occur under the No-action Alternative.

No mitigation measures for geology and soils are proposed.

4.3.1.5.2 Proposed Action— Geology and Soils, Tern Island

The Proposed Action includes new construction of a target launch facility, telemetry/instrumentation, ~~and~~ docking facilities, ~~with potential demolition of the wood shop~~ and modifications to the existing generator facility. The Proposed Action will also result in the launching of target missiles which will emit fuel residues, which potentially could contaminate the soil in the vicinity of the test launch.

No significant impacts to soils are likely to occur as a result of the proposed building modifications because the soils at each location have undergone extensive fill and surface grading in the past. Soil disturbance will be limited to the immediate vicinity of the potential launch pad. Tug moorage will potentially be created at the northwest end of the island by dredging the boat channel. New construction will be of short duration.

Best management practices would be exercised to reduce the potential for erosion during construction. Surface slopes on the island are relatively flat and do not promote erosion. Various measures may be recommended to reduce the potential for storm wave erosion as well as surface water erosion.

Proposed target missile launches at Tern Island will use solid propellants. Potential soil contamination could occur from rocket emissions forming hazardous residues in concentrations which would dictate a hazard to human health, or, in the event of an early flight termination, burning fuel may reach the ground. During nominal launches of a solid propellant missile, the primary emission products would include hydrogen chloride, aluminum oxide, carbon dioxide, carbon monoxide, nitrogen, and water.

No significant changes to soil chemistry are predicted to occur as a result of hydrogen chloride or aluminum oxide deposition from solid fueled target and interceptor launches. As described in Air Quality, soil deposition of hydrogen chloride is expected to be minimal because relatively small amounts of hydrogen chloride are released in the booster groundcloud, and the emissions disperse rapidly. In addition, no launches will occur during rain and the launch system will not use a water deluge system for cooling and noise suppression (a deluge system could increase the potential for ground deposition). No measurable direct or indirect, short-or long-term effects on soil chemistry are expected.

Potential deposition of aluminum oxide per launch is expected to be relatively small at Tern. Previous studies of solid-fueled rocket emissions at the KTF facility, Kauai, conducted by the DOE predicted that soil deposition of measurable levels of aluminum oxide resulting from a moving exhaust cloud should be negligible (U.S. Army Strategic Defense Command, 1 2, Feb, p. -3). Additionally, because of the launch location on the northeast side of the island, 13
the launch tra ectory away from the island, and the strong persistent wind conditions, it is expected that very little of these emissions will be deposited on land at Tern.

In the unlikely event of an on-pad fire or early flight failure over land of a solid propellant missile, most of the fuel would likely burn up before being extinguished. Any remaining fuel would be collected and disposed of as hazardous waste. Soil contamination, which could result from such an incident, is expected to be very localized at the point of the fire.

No other activities that could result in cumulative impacts would occur along with PMRF operations. The launch of up to four missiles a year would not result in any cumulative impacts to soil conditions on Tern Island. No other cumulative impacts have been identified.

In terms of mitigation measures, recommendations could include the use of rip-rap, minimizing the amount of area exposed during grubbing, the use of soil stabilizers, or the use of sandbags.

4.3.1.6 Hazardous Materials and Hazardous Waste— Tern Island

This section describes the potential impacts from hazardous materials and hazardous wastes that could occur from the No-action Alternative and the Proposed Action.

4.3.1.6.1 No-action Alternative— Hazardous Materials and Hazardous Waste, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloguing of marine debris and the removal of exotic plants, would have no impact on hazardous materials and hazardous waste on Tern Island.

In terms of cumulative impacts, the ongoing USFWS and NMFS activities would not contribute to any hazardous materials and hazardous waste impacts from the scheduled cleanup of contaminants on Tern Island. From 1 2 to 1 , the U.S. Coast Guard operated a LORAN station on Tern Island. Prior to this, the U.S. Navy operated an airfield and fueling station on the island from 1 2 to 1 . Large quantities of uncharacterized debris were landfilled on the island and some ~~was~~ were pushed directly into the ocean. U.S. Coast Guard field surveys conducted in 1 revealed that the marine debris consisted of batteries, transformers, a fuel tank, and other ob ects potentially hazardous to the environment. U.S. Coast Guard geophysical surveys of the land on the north side of the island, which is contained behind a deteriorating seawall, revealed massive quantities of metallic debris buried along most of the northern shore. The U.S. Coast Guard plans to remove the marine debris in September 1 8. The Service is currently completing the Service Contaminant Assessment Process Manual for Tern Island that will identify all potential sources of contamination on the island. (Poetter, 1 88, p.2) 88

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.3.1.6.2 Proposed Action— Hazardous Materials and Hazardous Waste, Tern Island

Under the Proposed Action, a solid propellant target launch system (including sea-based mobile launches in the nearby waters), radar, telemetry, optics, electronic warfare, DGPS, and communication, command, and control facilities could be located on the MATSS or at Tern Island. Construction of new facilities would be conducted in accordance with Corps of Engineers Safety and Health Requirements Manual. Hazardous materials used and hazardous waste generated from construction would include engine oil, oil filters, paint, paint thinners and waste solvents generated during maintenance of equipment and facility construction. The proposed facilities may require the renovation or demolition of existing structures and the construction of new facilities. The existing structures may have lead-based paint and asbestos. Construction activities could generate hazardous waste which would be crated and removed from the island for proper permitted disposal in accordance with State and Federal regulations.

Under the Proposed Action, there would be an increase in use of hazardous materials and generation of hazardous waste. Most of these materials would be related to solvents required for missile launching activities and maintenance required for proposed facilities and would only require very small amounts. In addition, diesel fuel may be required to operate electrical generators. All diesel storage tanks used on Tern Island would be above ground with the appropriate containment devices. Hazardous materials used on Tern Island would only be brought on the island when required for activities and would not be permanently stored on-site. Any hazardous waste generated would be removed after activities are completed, and disposed of in accordance with Federal and State regulations. PMRF would develop the appropriate hazardous materials management and spill plans for Tern Island which would be submitted to the USFWS for approval before pro ect initiation.

All potentially hazardous debris resulting from an accident of a solid propellant missile on the launcher or from early flight termination would be contained entirely within the ESQD or ground hazard area. Teams would be available for fire suppression and hazardous materials emergency. All hazardous materials generated during a missile mishap would be cleaned-up and remediated by PMRF and disposed of as hazardous waste in accordance with State and Federal regulations.

Overall, there would be no adverse hazardous materials or hazardous waste impacts from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, the increased amounts of hazardous materials used and hazardous waste generated under the Proposed Action in combination with current USFWS operations could result in cumulative hazardous materials and hazardous waste impacts if a spill or misuse of these materials occurred. However, as described above, PMRF would have the appropriate management plans in place to minimize any potential for a hazardous material or hazardous waste to impact the environment. PMRF would not leave any hazardous materials or hazardous waste on the island and would quicklyremediate any spill of these materials. No other activities on Tern Island that could result in cumulative impacts have been identified.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.3.1.7 Health and Safety— Tern Island

4.3.1.7.1 No-action Alternative— Health and Safety, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on health and safety.

No cumulative impacts would occur from the No-action Alternative.

No mitigation measures for health and safety are proposed.

4.3.1.7.2 Proposed Action— Health and Safety, Tern Island

Under the Proposed Action, a solid propellant target launch system on Tern Island (including sea-based mobile launches in the nearby waters), radar, telemetry, optics, electronic warfare, DGPS, and communication, command, and control facilities could be located on the MATSS moored at Tern Island. Construction of new facilities would be conducted in accordance with Corps of Engineers Safety and Health Requirements Manual. Construction of new facilities are routinely accomplished for both military and civilian operations, and present only occupation-related effects on safety and health for workers involved in the performance of the construction activity. Prior to the initiation of construction, workers would be briefed on the potential hazard the coral sand of the island presents if a worker has any open cuts. Any open cuts would be quickly cleaned to prevent infection. The siting of launch, ordnance, and instrumentation would be in accordance with DOD standards taking into account HERO, HERP, HERF, ESQD, and other facility compatibility issues. During missile preparation activities from east end launches, the 381-m (1,2 -ft) ESQD from the launch pad would not encompass the USFWS facilities requiring temporary evacuation of these buildings.

Prior to any missile launch from Tern Island or the nearby waters, a ground hazard area and launch hazard area would be established, taking into account the size and flight characteristics of the missile, expected wind conditions, individual flight profile for each exercise or flight test, and reaction time between recognition of a flight malfunction and the decision to terminate flight. For launches from Tern Island, unguided targetsare expected to be used which would require a 1 -m (2, -ft) ground hazard area (figure .3.1. -1). This figure also shows the flight corridor azimuthlimits for launches from Tern Island. Non-mission-essential personnel would be excluded from the ground hazard area during launch operations. The ground hazard area from launches on the east side of the island would not include the USFWS facilities on the west end, and would therefore not require evacuation of personnel, although all personnel would be encouraged to be on the MATSS during launches. Launches from the east end of the island would require personnel to be outside the 1-m (2, -ft) ground hazard area.

Apart from having to be outside the 1 -m (2, -ft) ground hazard area during missile launches and being limited to transient activities (e.g. normal, routine research activities) ~~outside~~inside the 381-m (1,2 -ft) ESQD for up to 1 days per launch, the regular daily activities of USFWS personnel on Tern Island would not be affected by the Proposed Action. During these periods, coordination with USFWS personnel for access into these areas would be made to minimize the impacts to their activities.

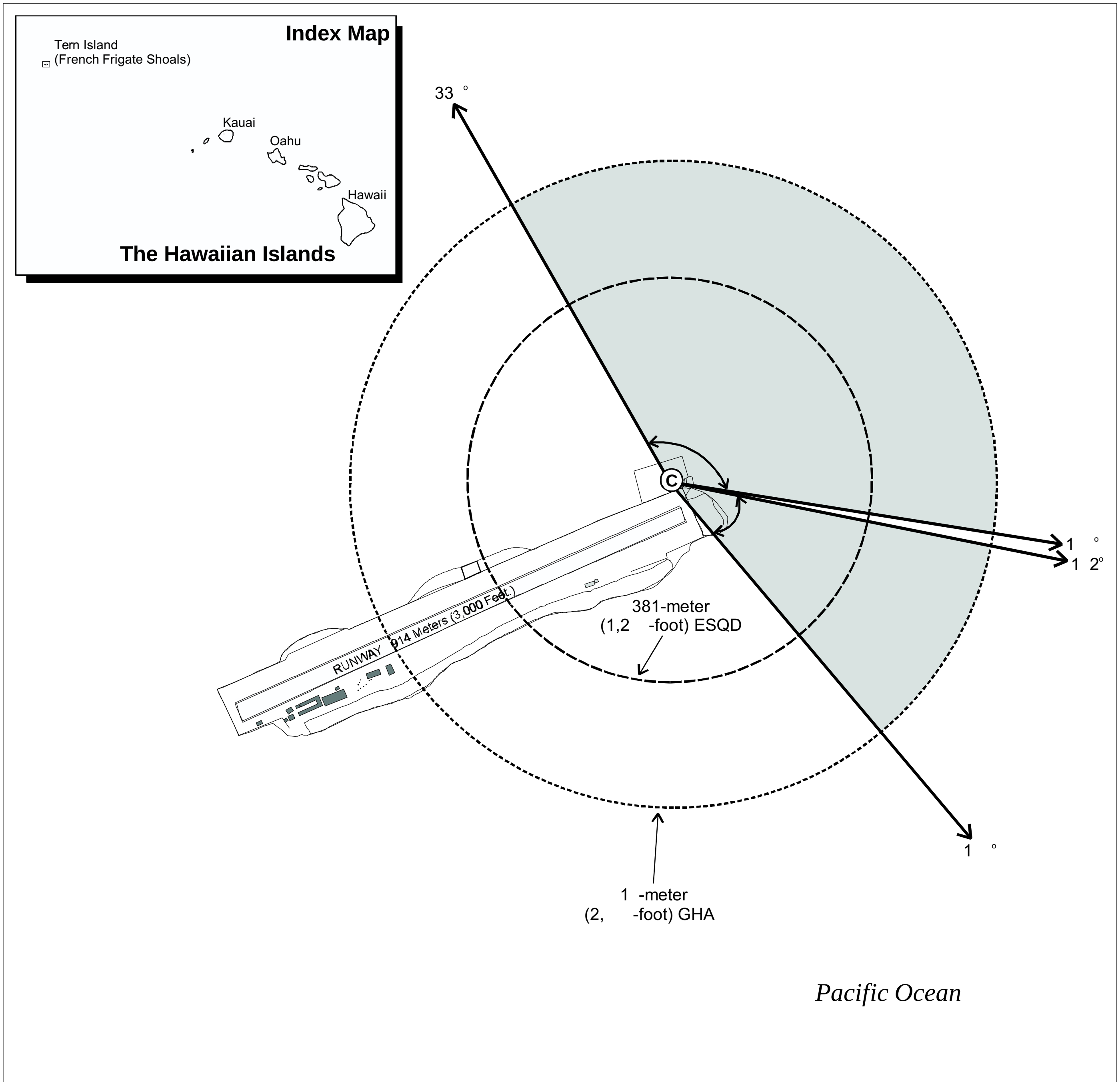
The launch hazard area (tra ectory azimuth) would encompass that area downrange over the ocean within the missile flight corridor. Before launch all missile intercept, debris, and stage impact areas would be determined clear of the public and non-essential personnel.

As a result of a nominal (successful) launch, the only identified potential hazard is the inhalation of rocket motor exhaust products released during the first few seconds of the launch operation. Concentrations are expected to reach undetectable levels by the time the plume reaches the boundaries of the ground hazard area or launch hazard area. Thus, personnel on Tern Island should not be exposed to concentrations exceeding the exposure limits.

Termination of flight shortly after liftoff would result in potentially hazardous debris being contained within the ground hazard area or launch hazard area where non-essential personnel would be excluded. Non-participating personnel would be moved to the MATSS. Air emissions from a flight termination could pose a health threat however, modeling conducted for the largest solid propellant booster determined that airborne pollutants from a terminated launch would not exceed health-based standards outside of the ground hazard area and, therefore, would not endanger personnel outside the ground hazard area.

Termination of flight after the aerial target or missile has left the launcher would occur over open water within the launch hazardarea which would be determined clear prior to launch. Because the termination would occur over open water away from the public, it would not pose any public health risks.

Prior to installation of any new radar unit on Tern Island, the Navy would conduct an EMR hazard review that considers hazards of EMR on personnel, fuel, and ordnance. The review provides recommendations for sector blanking and safety systems to minimize HERP, HERF, and HERO exposures. The proposed systems would have appropriate safety exclusion zones established prior to operation and each unit would have warning lights to inform personnel when the system is emitting EMR. These systems would be located on Tern Island or MATSS and would not represent a public health and safety risk. The proposed systems would be similar to existing systems used at PMRF.



Source: Modified from U.S. Department of the Interior, 1 8 , May, p.3.1

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EXPLANATION

A Potential New Facility Locations

Launch Direction

Flight Corridor/Azimuth Limits

381-meter (1,2 -foot) ESQD (Explosive Safety Quantity-distance)

1 -meter (2, -foot) GHA (Ground Hazard Area)

NORTH

Scale
1 288 Meters
3 Feet

Potential Ground Hazard Area and Flight Corridor Azimuth Limits (Revised)

Tern Island (French Frigate Shoals)

Figure 4.3.1.7-1

tern hs 1

Aerostat could be used ad acent to Tern Island or in nearby protected waters during TBMD and TMD operations. The potential health and safety issues are associated with EMR emissions and aircraft coming in contact with the tether cords attaching the Aerostat to a ship. As with any EMR operations, a survey addressing potential EMR emission to the ship personnel would be conducted prior to using Aerostat. Aerostat would be operated from 1 m (3, ft) mean sea level above the ship where there would be the potential for low-flying aircraft to come in contact with the system tethers or EMR emissions. To avoid any health and safety issues during operation, there would be a .8-km (3-mi) aircraft exclusion zone around the system. In addition, the system would have a transponder and beacon to warn aircraft.

Overall, there would be no adverse health and safety risks with implementation of the mitigation measures described below from the Proposed Action.

In terms of the potential for cumulative impacts, no other actions that present a significant health and safety risk occur at Tern Island therefore, no cumulative impacts would occur.

In terms of mitigation measures, because Tern Island is remote and does not have appropriate medical facilities, prior to any construction or launch operation, one member of the team could be a trained medical technician with the appropriate equipment to provide initial medical treatment until the in ured person can be moved to appropriate medical facilities if an in ury occurs.

To provide additional safety measure during launches from Tern Island, it is proposed that personnel would be onboard the MATSS moored at Tern Island. The program would also adopt the USFWS s emergency planning guidelines. Either of these measures would ensure the safety of personnel given the small size of the island.

In addition, there are meteorological requirements for missile launches based on safety considerations. Launches are not conducted during heavy rain or if range instrumentation detects a lightning potential gradient of more than 2, V per meter. Wind speed and direction and its influence on missile structural stability and the ability to compensate for these factors are also primary considerations. Wind data gathered prior to launch enables safety personnel to analyze missile performance under current weather conditions. The same data is used to model missile debris patterns in the unlikely event of an early flight termination to ensure that all potentially hazardous debris falls within hazard areas, which are determined clear for non-participants.

4.3.1.8 Land Use— Tern Island

4.3.1.8.1 No-action Alternative— Land Use, Tern Island

4.3.1.8.1.1 Land Use

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would not change existing land use and would have no impact on land use.

No cumulative impacts have been identified.

No mitigation measures for land use are proposed.

4.3.1.8.2 Proposed Action— Land Use, Tern Island

4.3.1.8.2.1 Land Use

Under the Proposed Action, the MATSS located off Tern Island would be used as a target launch system, and the~~,~~ radar, telemetry, optics, electronic warfare, and DGPS ~~and communication, command, and control~~ facilities would be located on ~~either~~ Tern Island. Another option would have these facilities on the~~or on~~ MATSS moored at Tern Island, if the proposed target launch pad on Tern Island itself is used The launch pad would require the development of additional land area using dredged coral.

The required ESQDs and ground hazard area for missile launch activities would occur over open land. The open undeveloped nature of the land would be compatible with the ground hazard areas and ESQDs safety requirements. The land area associated with theESQDs would only encompass an area of up to 381 m (1,2 ft) where access would be controlled for up to 1 days per launch for four launches per year or days per year. During these periods, coordination with USFWS personnel for access into the area would be made to minimize the impacts to their activities.

The land uses within the ground hazard area would continue except during launch operations, when the area would be determined clear for safety purposes for approximately 3 minutes per launch for up to four launches per year (a total of 2 hours per year). Therefore, current land use activities would continue and would be altered only temporarily by limiting access to the USFWS facilities and interrupting their activities from launches from the eastern end of the island for 2 hours per year.

The proposed radar and communication sites would be located so not to impact the USFWS administrative facilities and would be compatible with the surrounding open nature of the island.

Tern Island is within the Pacific Remote Islands National Wildlife Refuge complex, which was established for use as a preserve and breeding ground for native birds and is managed by the USFWS. The National Wildlife Refuge System Administration Improvement Act addresses the issue of use compatibility within a wildlife refuge. This act authorizes the Secretary of the Interior to permit uses of a refuge whenever he determines that such uses are compatible with the ma or purposes for which such areas were established. A compatible use is a use that will not materially interfere with or detract from the purposes for which the refuge was established. Before any of the Proposed Action construction and operation activities take place, the USFWS must first determine if the use is compatible with the HINWR. The Navy would request a determination based on the analysis contained within this EIS when it is determined that construction and operation would be required on Tern Island.

The activities associated with the Proposed Action would be consistent to the maximum extent practicable with the Hawaii Coastal one Management Program. Since public access to the island is restricted and no developed recreational activities occur on the island, activities would not affect recreational opportunities to the public. The proposed development would not affect any historic or prehistoric resources. The development would not alter any prominent vistas since access to the island is restricted. As discussed under biological resources, construction and operation would impact some biological species, especially the monk seal. The Navy would implement mitigation measures in consultation with the USFWS and NMFS to minimize impacts.

A compatibility determination is being sought from the USFWS regarding the use of Tern Island in order to ascertain whether the Proposed Action would constitute a conflict with land use plans, policies, or controls for Tern Island and the surrounding National Wildlife Refuge.

4.3.1.8.2.2 Recreation

Because access to Tern Island is restricted by the USFWS, recreational opportunities are limited to the few USFWS personnel on the island. Activities under the Proposed Action would only temporarily limit opportunities for up to 2 hours per year for the ground hazard area and up to days per year within the ESQD area.

Overall, there would be no adverse impacts to land use from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, Tern Island was altered from a small undeveloped island to one which includes an airstrip and several facilities by increasing the island size and adding a sea wall. Further development of the launch facilities would continue to alter the island and would further result in changes to the island s original use. The impacts of restricted access would be the same as described above. No other activities would add to cumulative land use impacts at Tern Island.

No mitigation measures for land use and recreation are proposed.

4.3.1.9 Noise— Tern Island

4.3.1.9.1 No-action Alternative— Noise, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on the noise environment at Tern Island. The approximately 18 flights and 18 sea-going vessel visits per year would generate short-term transient noise, but would have no adverse noise impacts.

No cumulative impacts have been identified for the No-action Alternative at Tern Island.

No mitigation measures for noise are proposed.

4.3.1.9.2 Proposed Action— Noise, Tern Island

Under the Proposed Action, potential new noise sources on Tern Island would be associated with temporary site construction, portable generators used during operations, the diesel engine of the MATSS tug, and target system missile launches. The island is maintained by a few USFWS personnel and the public does not have access to the island or surrounding area. The primary impact would be on the local bird population, as discussed in detail in the biological resources section.

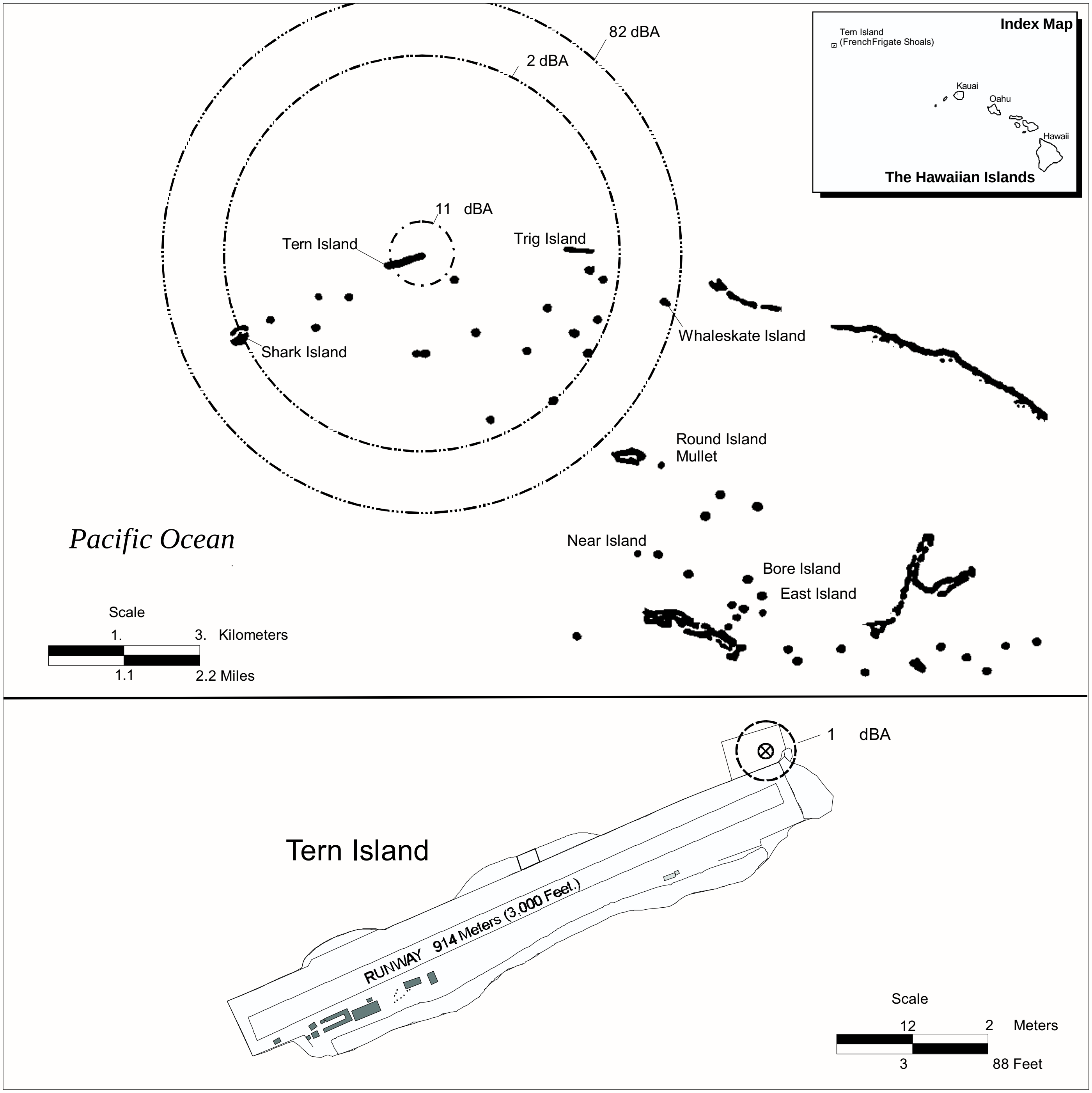
Construction related noise would be temporary in nature and occur during the day. The noise levels generated from these activities would be similar to any small construction pro ect. Since most construction would consist of adding dredge material to the island and erecting either a rail launcher or a radar/telemetry facility the overall length of activities should be less than months. Portable generators generate noise levels similar to the existing site generators and would only be operated during range operations. These operations would consists of up to four launches per year, and if a radar is installed, use of that facility to support launch activities in the area.

Assuming a 3, -horsepower engine for the tug, the noise generated by the intake, exhaust, and casing radiation is estimated to be dB at a distance of 1 m (ft) (Collier, 1 ,
p. 3). Generators, depending on the individual manufacturer and model could be expected 1
to generate noise levels of between 1 and 82dBA at 1 m (ft) (U.S. Environmental
Protection Agency, 1 1 p.11). 1 3

It is expected that no more than four target launches would occur from Tern Island per year. The maximum expected noise levels would be expected to be 1 dBA at 8 m (1 ft), 11 dBA at 3 m (2, 2 ft), 2 dBA at , m (1 , 3 ft), and 82 dBA at ,1 m (2 ,2 ft) from the launch point. Figure .3.1. -1 provides the expected noise contours from Tern Island. None of the noise levels outside of the ground hazard area where non-essential personnel are excluded would exceed either DOD or OSHA safety requirements. Potential noise impacts on wildlife are discussed under biological resources in section .3.1.3.2.

Sonic booms generated from launches on Tern Island would occur over the open water and would not impact the island. The size, shape and intensity of the sonic boom will depend on the size and shape of the target, the tra ectory, and the meteorological conditions. Sonic booms from launches can only occur when the missile has pitched over enough and reached supersonic speeds before leaving the atmosphere. As these details are not known at this time, for purposes of analysis the sonic boom that resulted from the launch of a Titan IV K-22 rocket from SLC- E at Vandenberg Air Force Base on 12 May 1 will be used as a representative case, although Titan rockets are not part of this Proposed Action. It must first be noted that the Titan IV is several times larger than any of the rockets considered in the Proposed Action, and is being used only due to the lack of data for sonic booms during launch for a ~~any~~ more representative launch vehicle.

The launch of the Titan IV rocket generated a carpet sonic boom with measured overpressures
from . to 2. psf (Space and Missile Systems Center, 1 , Jul, p.2). The launch also 1
generated a focused sonic boom with measured overpressure of 8. psf (Space and Missile
Systems Center, 1 , Jul, p.3). These measurements were made from 8 to km (3 to 1
mi) downrange of the launch site (Space and Missile Systems Center, 1 , Jul, p.1). 1



EXPLANATION

- 82 dBA (,1 meters)
- 2 dBA (, meters)
- 11 dBA (3 meters)
- 1 dBA (8 meters)
- ⊗ Launch Site

dBA A-weighted Decibel

NORTH

Maximum Expected Noise Levels (dBA) at Tern Island, Potential Site

Tern Island

Figure 4.3.1.9-1

tern ns 1

Both the carpet and the focused sonic boom were predicted by post flight analysis utilizing the PCBOOM computer model. Overpressures from . to 2 psf were predicted for the carpet sonic boom, and a maximum peak overpressure of . psf was predicted for the focused sonic boom (Space and Missile Systems Center, 1 , Jul, p.31). The computer model also 1
predicted the carpet sonic boom could extend as much as 1 km (mi) to each side of the ground track of the missile s tra ectory (U.S. Air Force, 1 , Sep, p.). 12

Given that a sonic boom was generated during the launch of a Titan IV, sonic booms may be generated by the launch of the target missiles considered in the Proposed Action. Depending most strongly on the details of the missile s tra ectories, launch sonic booms may impact islands that lie along the ground track of the tra ectory. The primary impact from a sonic boom would be on the local bird population, as discussed under the biological resource sections.

In terms of the potential for cumulative impacts, the noise environment on Tern Island mostly consists of natural noises except the occasional aircraft flight or the small generators that provide backup electricity to the island. The increased activities would result in up to four launches per year on the island and the operations associated with these launches. Although PMRF operations would be intermittent on the island, the noise generated under the Proposed Action would involve a new source not normally heard. However, given the few proposed launch operations and other activities, ambient noise levels are not expected to substantially increase over baseline conditions.

No mitigation measures for noise are proposed.

4.3.1.10 Transportation— Tern Island

4.3.1.10.1 No-action Alternative— Transportation, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on transportation.

No adverse cumulative impacts would result from the No-action Alternative.

No mitigation measures for transportation are proposed.

4.3.1.10.2 Proposed Action— Transportation, Tern Island

New docking facilities would be constructed to support launch activities. Activities would result in additional flights to the island. Impacts as a result of new construction would be positive.

No adverse cumulative impacts would result from the Proposed Action.

No mitigation measures for transportation are proposed.

4.3.1.11 Utilities— Tern Island

4.3.1.11.1 No-action Alternative— Utilities, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on utilities. Power is supplied by solar powered cells, with only backup generators.

No cumulative impacts would result from the No-action Alternative.

No mitigation measures for utilities are proposed.

4.3.1.11.2 Proposed Action— Utilities, Tern Island

All existing facilities would remain self-contained. Solid waste would be collected and removed from the island. No adverse impacts are expected.

No adverse cumulative impacts are expected.

No mitigation measures for utilities are proposed.

4.3.1.12 Visual and Aesthetic Resources— Tern Island

4.3.1.12.1 No-action Alternative— Visual and Aesthetic Resources, Tern Island

Under the No-action Alternative with ongoing USFWS and NMFS activities, there would be no change to the visual environment on Tern Island. As described in the affected environment, the original visual environment of Tern Island has been changed by the addition of dredged material for island expansion, an airstrip, and several facilities. However, no prominent public view points are obstructed since access to the island is restricted therefore, no impacts would occur.

In terms of the potential for cumulative impacts, the past modifications and development of facilities to support government operations on Tern Island (airstrip and support facilities) have cumulatively impacted the original visual environment. However, no prominent public view points are obstructed since access to the island is restricted. No development is planned as part of the No-action Alternative that would further change the visual environment.

No mitigation measures for visual and aesthetic resources are proposed.

4.3.1.12.2 Proposed Action— Visual and Aesthetic Resources, Tern Island

Under the Proposed Action, a target launch system, radar, telemetry, optics, electronic warfare, DGPS, and communication, command, and control facilities could be located on Tern Island or on the MATSS moored at Tern Island. In addition, an Aerostat attached to a MATSS could be located offshore.

The proposed facilities at Tern Island would not contrast with the developed man-made nature of the island. Because Tern Island already contains facilities and an airstrip that occupies the ma ority of the island, mostly surrounded by sea wall, the proposed facilities would not be out of character with the existing visual environment. In addition, no prominent vistas would be obstructed since public access to the island is restricted therefore, no impacts would occur.

In terms of the potential for cumulative impacts, the original visual environment of Tern Island was altered when the island was enlargedfor an airstrip and support facilities. The addition of the proposed facilities would further alter the visual environment however, no prominent vistas would be obstructed since public access to the island is restricted.

No mitigation measures for visual and aesthetic resources.

4.3.1.13 Water Resources–Tern Island

4.3.1.13.1 No-action Alternative— Water Resources, Tern Island

Ongoing USFWS and NMFS wildlife monitoring, surveying, and research activities, along with the collection and cataloging of marine debris and the removal of exotic plants, would have no impact on water resources.

4.3.1.13.2 Proposed Action— Water Resources, Tern Island

Potential impacts that could result from proposed construction activities at Tern Island include increased turbidity and contamination of surface waters. Impacts could also result from launch-related activities such as changes in water chemistry due to deposition of launch emissions, chemical simulants, and missile debris.

4.3.1.13.2.1 Construction Activities

Construction activities at potential launch and instrumentation sites on Tern Island would involve routine construction activities including earthwork, concrete forming and working, and small building construction. These operations are routinely accomplished in both military and civilian construction operations, and would follow standard engineering techniques to control erosion. Surface drainage would not be substantially modified.

Construction activities for one target launch site would result in a disturbance of approximately .3 ha (. ac) of land, and an instrumentation site approximately .2 ha (. ac). Assuming one target launch site and two instrumentation sites, less than 2 ha (ac) would be disturbed, and the construction would not be sub ect to NPDES permitting requirements.

4.3.1.13.2.2 Flight Test Activities

Surface Water

Impacts to surface waters within the Tern Island region of influence, including the water catchment system, would be primarily associated with combustion emissions deposition in near-shore ocean waters. Combustion emissions are composed primarily of hydrogen chloride, aluminum oxide, and water. Although hydrogen chloride is very soluble in water, it does not deposit readily onto dry aerosols or other dry surfaces when the relative humidity is below 1 percent. Because the atmosphere, under launch conditions when there is no rain for 2 hours after the event, would have a relative humidity lower than 1 percent, direct dry deposition of hydrogen chloride gas onto the ground and vegetation would not be significant. Similarly, the deposition of aluminum oxide would be very low. Section .2.1.1 .2 (Niihau) contains a discussion of the potential deposition associated with target missile launches. Because launches would ~~not be~~occur over the island itself, only gaseous emissions would be deposited in the water catchment system. Impacts would also be minimized by the prevailing trade winds.

Impacts to water resources, including the water catchment system, could also occur from SRM propellants following a flight termination. Section .2.1.1 .2 (Niihau), includes a complete discussion of SRM propellants. In summary, the solid rocket motors proposed for use in both the interceptor and target missiles would consist primarily of AP and an HTPB binder. Based
on the findings of several previous studies (U.S. Air Force, 1 8 , Oct, p.2 Air Force Wright 12
Aeronautical Laboratories AFWAL, 1 8 , Oct, p.22 through 3 Moscow Department of Public 1
Sanitation, 1 , 2 Sep, p.3 through , 1 U.S. Air Force, 1 83, p. 3 through) Alcorn , 123
State University, 1 , 1 Jun, p.2 through 2), AP would not result in appreciable changes in 2
marine water chemistry (i.e., pH, BOD, and nitrogen levels). In addition, changes in chloride
levels resulting from AP deposition in seawater would not be significant in nature (Boyer,
1). 1

Because the HTPB binding agent is essentially insoluble in water and does not seem to have an appreciable toxicity for aquatic organisms, concerns regarding increased toxicity levels would be primarily associated with that of AP. However, any AP leaching from the binding agent would disperse quickly and would be diluted and neutralized by the natural buffering capacity of the sea. Even in the most conservative analysis involving the impact of a fully loaded vehicle in the ocean environment, the volume of AP involved is small and the effects are not considered persistent. As a result, potentially toxic concentrations within more than a few meters of the propellant would not be anticipated (National Aeronautics and Space
Administration, 1 3, Jul, p.3 Kataoka, 1 , Jun). 3, 3

The corrosion of missile hardware within an aqueous environment would contribute various metal ions to the surrounding environment. The rate of corrosion of such materials is slow in comparison to the mixing and dilution rates in the water environment, and hence, toxic concentrations of metal ions will not result. The miscellaneous materials (e.g., battery electrolytes) are present in such small quantities that only extremely localized and temporary effects would be anticipated.

There would be no water resources impacts from operating the MATSS at Tern Island. The gray and black water waste will be stored onboard for the duration of an operation. The gray water tank, like the black water tank, is contained within the tankage space below the Machinery Space. Provision has been made to be able to pump the waste water to a standard fitting on the hull of the vessel for offloading to a sewage barge at the Naval Inactive Ship Maintenance Facility in Pearl Harbor following the operation.

Groundwater

Potable groundwater within the region of influence is very limited. Measurable groundwater contamination as a result of launch activities is highly unlikely because of the limited quantities of missile exhaust emissions that would reach the ground, and the standard spill prevention, containment, and transportation safety plans that would be implemented.

In terms of the potential for cumulative impacts, direct and indirect impacts to water resources are not expected to result in substantial long-term changes in water chemistry, degradation of potable water sources, or substantially diminished aquatic habitat value. No other activities have been identified at Tern Island that, when combined with the Proposed Action, would result in cumulative impacts to water resources.

In terms of mitigation measures, portable filtration equipment and chemical treatment systems could be brought in to treat any catchment system water that was affected by launch emissions.

4.3.2 JOHNSTON ATOLL

Although Johnston Atoll was originally a site alternative in the Draft EIS, the Navy has determined that it is not a reasonable alternative and therefore has been eliminated as a proposed site in this EIS. The lack of program requirements for the use of Johnston Atoll has also led the Navy to eliminate it from further consideration. The discussion and analysis on Johnston Atoll have been retained in this EIS, however, in order to preserve the work that has already been performed. The determination that Johnston Atoll is no longer a reasonable alternative takes precedence over these other discussions concerning Johnston Atoll in this EIS.

In 1 83 the U.S. Army prepared an EIS to assess impacts from construction and operation of the JACADS facility (U.S. Department of the Army, 1 83) and in 1 88 prepared a 1 3
supplemental EIS (SEIS) to examine the disposition of solid and liquid waste produced by the JACADS facility (U.S. Department of the Army, 1 88). In 1 , a Final Second SEIS (SSEIS) 1
assessed the effects of the Army s proposed near-island transportation, storage, and ultimate destruction at the JACADS facility of the U.S. stockpile of unitary chemical munitions currently stored in the Federal Republic of Germany European stockpile. (U.S. Department of the Army, 1) This final SSEIS focused on the incremental and cumulative impacts attributable to the 1
European stockpile relative to the destruction of the existing Johnston Island stockpile. In addition, this Final SSEIS addressed new issues raised since the 1 83 EIS and updated earlier baseline information.

Together, these three NEPA documents address the JACADS portions of the No-action Alternative environmental impacts at Johnson Atoll. The following No-action Alternative discussions under each environmental resource area address only the impacts to ongoing USFWS activities at Johnston Atoll, particularly at North, East, and Sand islands.

4.3.2.1 Air Quality— Johnston Atoll

4.3.2.1.1 No-action Alternative— Air Quality, Johnston Atoll

Ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on air quality.

No cumulative impacts would occur as a result of the No-action Alternative.

No mitigation measures for air quality are proposed.

4.3.2.1.2 Proposed Action— Air Quality, Johnston Atoll

Johnston Atoll is a potential target launch site. As such, the Proposed Action could cause air quality impacts due to site preparation activities, launch support activities, and missile launch activities.

Site preparation emissions would be similar to those presented in section .3.1. Assuming a launch site construction area of approximately . ha (1. ac), TSP and PM-1 emissions would not be anticipated to exceed 1,81 kg (2 tons) per month and kg (1 ton) per month while construction is underway (AP- 2). Other pollution emissions related to site preparation would include diesel exhaust from construction equipment and limited amounts of VOCs due to fumes from paints, solvents, and cleansers. Specific amounts of these emissions would depend upon the specific equipment required to prepare the launch sites.

Launch support activity emissions and potential for air quality impacts would also be similar to those presented in section .3.1. Johnston Atoll is in a remote location, and the launch sites are geographically isolated from the island s inhabitants. There would be no anticipated impacts to air quality due to the proposed launch support activities.

Air quality impacts due to the proposed missile launches at Johnston Atoll would not be anticipated to exceed those presented for PMRF ~~in~~ (section .1.1.1). The missiles proposed for launch at Johnston Atoll would be similar to those analyzed previously. Specific potential impacts include possible short-term exceedances of health-based guidance levels within the ground hazard area for hydrogen chloride. No exceedances of NAAQS or health-based guidance levels would be anticipated beyond the ground hazard area. Thus, no adverse impacts are expected to occur.

In terms of the potential for cumulative impacts due to the relative isolation of the launch location, intermittent nature of launch emissions, and prevalent weather patterns, there would be no anticipated cumulative impact to air quality.

In terms of mitigation measures, standard construction measures to reduce fugitive dust could be implemented. These measures could include periodic wetting of the disturbed soils at the construction sites.

4.3.2.2 Airspace— Johnston Atoll

4.3.2.2.1 No-action Alternative— Airspace, Johnston Atoll

Ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on airspace use.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.3.2.2.2 Proposed Action— Airspace, Johnston Atoll

The proposed pre-test flight site modification/construction activities, the land-based operations and training, and base operations and maintenance activities on Johnston Atoll would have no impact on airspace use. Test flight operations, however, do have the potential for impacts to airspace use. These are discussed in section . .1.1 because Johnston Atoll lies in the ocean area airspace use region of influence.

No incremental, additive cumulative impacts have been identified.

No mitigation measures for airspace are proposed.

4.3.2.3 Biological Resources— Johnston Atoll

4.3.2.3.1 No-action Alternative— Biological Resources, Johnston Atoll

Under the No-action Alternative, the USFWS will continue to act as a caretaker of, and conduct research on, the biological resources within the atoll with minimal impact to these resources. Following the completion of the current ongoing military programs, the USFWS would remain as the manager of the national wildlife refuge.

There are no cumulative impacts associated with the No-action Alternative.

No mitigation measures for biological resources are proposed.

4.3.2.3.2 Proposed Action— Biological Resources, Johnston Atoll

4.3.2.3.2.1 Construction

Construction-related impacts on biological resources at Johnston Atoll are expected to range in their intensity, depending on theaction taking place. Construction of launch facilities on North or East islands, and instrumentation on Sand Island would require clearing and removal of nesting habitat currently being used by a variety of seabirds and migratory shorebirds. The islands of Johnston Atoll are the only terrestrial surfaces in about2,123, km^2 (3 ,13 nmi^2)~~2. million square km (1 million square mi)~~ of ocean. Johnston Atoll consists of 28 ha (1 ac). A relatively small amount of land surface (approximately 2 ha ac) would be adversely impacted by~~from~~ the Proposed Action activities. The remodeling or demolition and reconstruction of existing buildings onNorth and East islands would be a low impact because the sites are already disturbed. However, increased human activity and construction noise would be expected to generate a greater magnitude impact on the nesting bird population.

Dredging of the existing channel to East Island to accommodate MATSS and its tug would destroy areas of coral reef, and increase siltation and turbidity in the ad acent parts of the lagoon. ~~Increase in T~~turbidity may increase the presence of the dinoflagellate *Gambierdiscus toxicus*, and therefore the incidence of ciguatoxins in the fish in the vicinity of the widened channel. However, the potential impact of dredging is not expected to eopardize the survival of any fish or marine mammal species. Biological and geological studies would be conducted before dredging operations are initiated in coordination with USFWS and NMFS to identify any necessary mitigation measures.

Construction activity related to the Proposed Action would not adversely affect marine biological resources.

4.3.2.3.2.2 Operations

Some disturbance to nesting seabirds and migratory birds due to launch-related noise described in section .3.2. may be expected, along with disturbance from the MATSS tug diesel engine and the on-deck generators. The difficulties in assessing the effects of noise on wildlife would be similar to those described in section .3.1.3.2 for Tern Island. As a result of the startle effect, the birds may leave their nests. Some eggs may be damaged by the rapid movements of the parent birds and some may be damaged by predation by other birds. Some individuals may move away from preferred nesting locations because of the increased human activity. Bird strikes and the resulting in uries and death may occur as a result of the increase in antenna structures present during operations. These impacts are ~~not~~ expected to be negligible~~adverse~~ with a frequency of only four launches per year.

Marine biological resources are not expected to be impacted by the operation of the Proposed Action. The probability of debris from an early flight termination hitting a sensitive species such as ~~a marine mammal~~, whales, seals~~seal,~~ or a sea turtle is extremely low (U.S. Army Strategic Defense Command, 1 2, Feb, p. -2 through -28). Launch noise impacts are not 13
an issue because the occasional Hawaiian monk seals that use the atoll lagoon do not pup on any of the islands. None of the threatened or endangered species that occur at Johnston Atoll would be affected by the Proposed Action.

The potential impacts of missile and target launches on biological resources at launch sites and in the ground hazard areas surrounding a launch site have been evaluated in detail in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1 2, Feb, p. -3 through -3). These impacts have been summarized in section .1.1.3.1.1, Land-Based 13
Training and Operations. With adequate fire suppression and given the non-native character of the vegetation near the proposed locations, few potential impacts would occur from fires started by early launch termination. The increased presence of humans (technical personnel) at the launch sites and at the instrumentation sites would be a negligible impact since they would be restricted to staying within the sites to which they are assigned.

No cumulative impacts are expected to affect biological resources at Johnston Atoll as a result of the Proposed Action. No other pro ects are planned for the outer islands, North, East and Sand, and the area proposed for use on Johnston Island currently is not used as a nesting or roosting area by the seabird and migratory shorebird populations. No impacts associated with the Proposed Action are expected to affect the threatened, endangered, or sensitive marine species that occur at Johnston Atoll.

Mitigation measures could include: (1) use of Johnston Island as a launch location, when it can be done safely, (~~1~~2) restriction of construction and launch team personnel to the immediate area necessary for the completion of their work, and (~~2~~3) use of best engineering practices and common sense in minimizing impacts to the biological resources at the sites to be used under the Proposed Action. Biological and geological studies would be conducted before dredging operations were initiated.

4.3.2.4 Cultural Resources— Johnston Atoll

Due to its historic role as military support site during World War II and as an atmospheric nuclear testing site during the Cold War, as well as its unique high-technology engineering facilities with capabilities for neutralizing chemical weapons (for example, JACADS), the facilities at Johnston Atoll could eventually be eligible for listing as a district in the National Register of Historic Places.

4.3.2.4.1 No-action Alternative— Cultural Resources, Johnston Atoll

Ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on cultural resources.

No cumulative impacts would occur as a result of the No-action Alternative.

No mitigation measures for cultural resources are proposed.

4.3.2.4.2 Proposed Action— Cultural Resources, Johnston Atoll

New construction would be required for target launches. Renovation, modification, expansion, and/or new construction of launch support buildings will be necessary to meet program requirements. Potential launch and telemetry sites would be located on North, East, and Sand Islands. A command and control center could be developed within existing buildings on Johnston Island.

Impacts to potentially significant historic resources include modification and alteration of existing buildings and structures related to support of Allied military activity for the Pacific Theater during World War II and to buildings and structures associated with the United States DOD activities during the Cold War.

Impacts to the potentially significant historic resources located within the region of influence (North, East, and Sand islands) could occur as a result of debris generated by a launch-pad mishap or as a result of an accidental launch vehicle ground strike. The probability of this occurring, however, is extremely remote. Exposure to certain levels of noise-induced vibration resulting from missile launches and sonic booms created by missiles traveling in excess of the speed of sound could be potentially detrimental to the structural integrity of existing buildings and structures, but this probability is also remote.

Impacts to potentially historic buildings and structuresare~~is~~ not expected to be ~~not~~ significant as a result of short duration noise-induced vibrations produced by the Proposed Action.

No cumulative impacts to potentially significant historic cultural resources are expected as a result of the Proposed Action. Given Johnston Atoll s previous historical role as a high-technology counter-offensive research and test site as well as its current chemical weapons deactivation mission, implementation of PMRF s Proposed Action would actually contribute to the enhancement of the character and history of Johnston Atoll.

In terms of mitigation measures, in compliance with the NHPA Section 1 review and comment process and the ACHP s regulations implementing Section 1 (3 CFR 8), PMRF would consult with the appropriate SHPO, the ACHP, and the DSWA to establish and/or implement measures to ensure mitigation of any adverse impacts to potential historic resources that could result from PMRF s Proposed Action on Johnston Atoll.

4.3.2.5 Geology and Soils— Johnston Atoll

The physical structure or chemical composition of soils underlying Johnston Atoll could potentially be affected by construction or launch activities. The region of influence for this resource includes the land at Sand, North, andEast islands identified for potential new construction and ground hazard areas associated with proposed launch facilities at North and East islands.

4.3.2.5.1 No-action Alternative— Geology and Soils, Johnston Atoll

Under the No-action Alternative, ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on geology and soils.

No cumulative impacts would occur under the No-action Alternative.

No mitigation measures for geology and soils are proposed.

4.3.2.5.2 Proposed Action— Geology and Soils, Johnston Atoll

The Proposed Action includes new construction of a target launch facility, and telemetry/instrumentation sites. The Proposed Action will also result in the launching of target missiles which will emit fuel residues, which potentially could contaminate the soil in the vicinity of the test launch.

No significant impacts to soils are likely to occur as a result of the proposed building modifications because the soils at each location have undergone extensive fill and surface grading in the past. Soil disturbance will be limited to the immediate vicinity of two potential launch pads (Site A at North Island and Site B at East Island).

Proposed target missile launches at North or East islands will use solid fuel propellants for target launches. Potential soil contamination could occur from rocket emissions forming hazardous residues inconcentrations which would dictate a hazard to human health, or, in the event of an early flight termination, burning fuel may reach the ground. During nominal launches of a solid propellant missile, the primary emission products would include hydrogen chloride, aluminum oxide, carbon dioxide, carbon monoxide, nitrogen, and water.

No significant changes to soil chemistry are predicted to occur as a result of hydrogen chloride or aluminum oxide deposition from solid fueled target and interceptor launches. As described in the Air Quality section, soil deposition of hydrogen chloride is expected to be minimal because relatively small amounts of hydrogen chloride are released in the booster ground cloud and the emissions disperse rapidly. In addition, no launches will occur during rain and the launch system will not use a water deluge system for cooling and noise suppression (a deluge system could increase the potential for ground deposition). No measurable direct or indirect, short-or long-term effects on soil chemistry are expected.

Potential deposition of aluminum oxide per launch is expected to be relatively small. Previous studies of solid-fueled rocket emissions at KTF, performed by the DOE predicted that soil deposition of measurable levels of aluminum oxide resulting from a moving exhaust cloud
should be negligible (U.S. Army Strategic Defense Command, 1 2, Feb, p. -3). 13

In the unlikely event of an on-pad fire or early flight failure over land of a solid propellant missile, most of the fuel would likely burn up before being extinguished. Any remaining fuel would be collected and disposed of as hazardous waste. Soilcontamination which could result from such an incident is expected to be very localized at the point of the fire.

No other activities that could result in cumulative impacts would occur along with PMRF operations. The launch of up to four missiles a year would not result in any cumulative impacts to soil conditions on North and East Islands. No other cumulative impacts have been identified.

No mitigation measures for geology and soils are proposed.

4.3.2.6 Hazardous Materials and Hazardous Waste— Johnston Atoll

4.3.2.6.1 No-action Alternative— Hazardous Materials and Hazardous Waste, Johnston Atoll

Ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on hazardous materials and hazardous waste since these activities would not introduce or use hazardous materials or waste.

No cumulative impacts have been identified.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.3.2.6.2 Proposed Action— Hazardous Materials and Hazardous Waste, Johnston Atoll

The Proposed Action would provide for launching targets, and for supporting instrumentation. The Proposed Action would involve construction of new launch facilities on North or East Islands and instrumentation on Sand, North, orEast islands. No new facilities would be constructed on Johnston Island. Hazardous materials used and hazardous waste generated from construction would include engine oil, oil filters, paint, paint thinners, and waste solvents generated during maintenance of equipment and facility construction. Construction activities would be handled underexisting Johnston Atoll hazardous materials management plans. Some facilities on Sand, East, or North islands may require the renovation or demolition of existing structures. The existing structures may have lead-based paint and asbestos, and construction activities would generate hazardous waste which would be crated and removed from the island for proper permitted disposal in accordance with Federal regulations. The only known site contamination in proposed construction areas is an oldmunitions range on North Island. If construction occurs in this area, the site would beremediated prior to activities.

Under the Proposed Action there would be an increase in use of hazardous materials and generation of hazardous waste. Most of these materials would be related to solvents required for missile launching activities and maintenance required for proposed facilities and would only require very small amounts. In addition, diesel fuel may be required to operate electrical generators. All diesel storage tanks used on Johnston Atoll would be above ground with the appropriate containment devices. Hazardous materials used on Johnston Atoll would only be brought on when required for activities and would not be permanently stored on-site. Any hazardous waste generated would be removed after activities are completed and disposed of in accordance with Federal regulations. In coordination with Johnston Atoll Officials, PMRF would develop the appropriate hazardous materials management and spill plans.

All potentially hazardous debris resulting from an accident of a solid propellant missile on the launcher or from early flight termination would be contained entirely within the ESQD or ground hazard area. Teams would be available for fire suppression and hazardous materials emergency. All hazardous materials generated during a missile mishap would be cleaned-up and remediated by PMRF and disposed of as hazardous waste in accordance with State and Federal regulations, and in coordination with the USFWS.

In terms of the potential for cumulative impacts, the increased amounts of hazardous materials used and hazardous waste generated under the Proposed Action could result in cumulative hazardous materials and hazardous waste impacts if a spill or misuse of these materials occurred. However, as described above, the appropriate management plans would be in place to minimize any potential for a hazardous material or hazardous waste to impact the environment. PMRF would not leave any hazardous materials or hazardous waste on the Johnston Atoll and would quicklyremediate any spill of these materials. Since the hazardous materials and hazardous waste used or generated by PMRF would not be left on Johnston Atoll, they would not cumulatively add to the current amounts of hazardous materials on the atoll. No other activities have been identified that could result in a cumulative impact.

No mitigation measures for hazardous materials and hazardous waste are proposed.

4.3.2.7 Health and Safety— Johnston Atoll

4.3.2.7.1 No-action Alternative— Health and Safety, Johnston Atoll

Under the No-action Alternative, ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on health and safety.

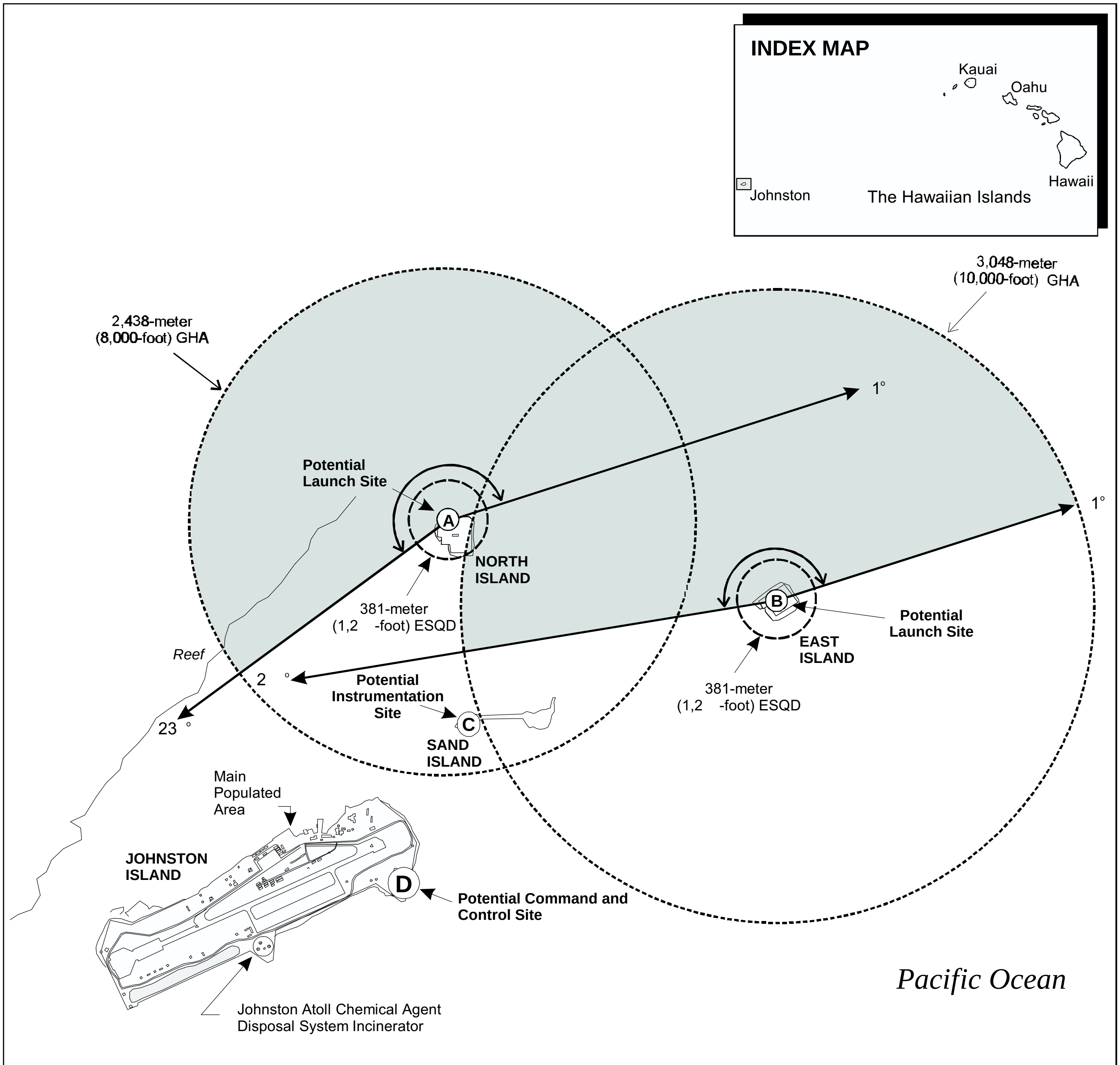
No cumulative impacts have been identified from the No-action Alternative.

No mitigation measures for health and safety are proposed.

4.3.2.7.2 Proposed Action— Health and Safety, Johnston Atoll

Under the Proposed Action, solid propellant target launch facilities and instrumentation (radars, optics) could be located at either North or East Islands and instrumentation on Sand Island or on the MATSS moored off either island. No new facilities would be constructed at Johnston Island, and no liquid propellants would be required. Construction of new facilities would be conducted in accordance with the Corps of Engineers Safety and Health Requirements Manual. Construction of new facilities is routinely accomplished for both military and civilian operations and presents only occupational-related effects on safety and health for workers involved in the performance of the construction activity. Before construction, workers would be briefed on the potential hazard the coral sand of the island presents if a worker has any open cuts. ~~Any~~ O~~o~~pen cuts would be quickly cleaned to prevent infection. The siting of launch, ordnance, and instrumentation facilities on North, East, and Sand islands would be in accordance with DOD standards taking into account HERO, HERP, HERF, ESQD, and other facility compatibility issues. Because these islands are unoccupied, no health and safety risk to personnel would occur except duringoperations which would occur approximately four times per year.

Prior to any missile launch from either North or East island, a ground hazard area and launch hazard area would be established, taking into account the size and flight characteristics of the missile, expected wind conditions, individual flight profile for each exercise or flight test, and reaction time between recognition of a flight malfunction and the decision to terminate flight. Non-mission-essential personnel would be excluded from the ground hazard area during launch operations and encouraged to be on the MATSS. The ground hazard areas would be no greater than 2, 38 m (8, ft) for North Island and 3, 8 m (1 , ft) for East Island (figure .3.2. -1). The launch hazard area (tra ectory azimuth) would encompass that area downrange over the ocean within the missile flight corridor. Figure .3.2. -1 also shows the flight corridor azimuth limits for launches from both North and East islands. At no time would the ground hazard area or launch hazard area encompass Johnston Island or other inhabited islands. Prior to launch all missile intercept, debris, and stage impact areas would be determined clear of the public and non-essential personnel. Because the ground hazard area would not encompass Johnston Island, no debris from a missile mishap would impact the chemical agents stored on the island.



Source: Modified from U.S. Department of the Interior, 1 3, p.

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EXPLANATION

- B — Potential New Facility Locations
- Launch Direction
- Flight Corridor/Azimuth Limits
- 381-meter (1,2 -foot) ESQD (Explosive Safety Quantity-Distance)
- Ground Hazard Area (GHA)

NORTH

Scale
3 1, Meters
2,3 , 2 Feet

Potential Ground Hazard Area and Flight Corridor Azimuth Limits (Revised)

Johnston Atoll

Figure 4.3.2.7-1

ohnston hw 1

The only identified potential hazard of a nominal (successful) launch is the inhalation of rocket motor exhaust products released during the first few seconds of the launch operation. Modeling and monitoring of a Strategic Target System missile (the largest target expected to be launched from Johnston Atoll) showed concentrations would reach undetectable levels by the time the plume reaches the boundaries of the ground hazard area or launch hazard area, and thus personnel on Johnston Island should not be exposed to concentrations exceeding the exposure limits.

Termination of flight shortly after lift would result in potentially hazardous debris being contained within the ground hazard area or launch hazard area where the public and non-essential personnel would be excluded.Air emissions from a flight termination could pose a health threat however, modeling conducted for the largest solid propellant target Strategic Target System determined that airborne pollutants from a terminated launch would not exceed health-based standards outside the ground hazard area, and therefore would not endanger personnel outside the ground hazard area. Termination of flight after the aerial target or missile has left the launches would occur over open water within the launch hazard area, which would be determined clear of non-participants before launch. Because the termination would occur over open water away from the public, it would not pose any public health risks.

In addition, there are meteorological requirements for missile launches based on safety considerations. Launches are not conducted during heavy rain or if range instrumentation detects a lightning potential gradient of more than 2,   V per meter. Wind speed and direction and its influence on missile structural stability and the ability to compensate for these factors are also primary considerations. Wind data gathered prior to launch enables safety personnel to analyze missile performance under current weather conditions. The same data is used to model missile debris patterns in the unlikely event of an early flight termination to ensure that all potentially hazardous debris falls within cleared hazard areas.

Prior to installation of any new radar unit on either North, East, or Sand islands the Navy would conduct an EMR hazard review that considers hazards of EMR on personnel, fuel, and ordnance. The review provides recommendations for sector blanking and safety systems to minimize HERP, HERF, and HERO exposures. The proposed systems would have the appropriate safety exclusion zones established prior to operation and each unit would have warning lights to inform personnel when the system is emitting EMR. These systems would be located on either North, East, or Sand Islands and would not represent a public health and safety risk. The proposed systems would be similar to existing systems used at PMRF.

All hazardous materials used and hazardous waste generated at the site under the Proposed Action would continue to be handled according to Federal and State regulations and operations would be conducted according to OSHA guidelines.

No other actions that present a significant health and safety risk occur at North or East islands, and proposed activities would not affect Johnston Island therefore, no cumulative health and safety impacts would occur.

Overall, there would be no adverse health and safety risks from implementation of the Proposed Action.

In terms of the potential for cumulative impacts to health and safety, none have been identified.

No mitigation measures for health and safety are proposed.

4.3.2.8 Land Use— Johnston Atoll

4.3.2.8.1 No-action Alternative— Land Use, Johnston Atoll

Under the No-action Alternative, ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on land use.

No cumulative impacts would occur from the No-action Alternative.

No mitigation measures for land use are proposed.

4.3.2.8.2 Proposed Action— Land Use, Johnston Atoll

4.3.2.8.2.1 Land Use

Under the Proposed Action, target launch facilities, would be located on North or East islands and the radar, telemetry, optics, electronic warfare, DGPS, communication, and instrumentation on Sand Island or on the MATSS. No new facilities would be required for Johnston Island. Command and control facilities could be located on the southeast corner of Johnston Island. The development of these facilities and the required safety ESQD arcs would be compatible with the open uninhabited land uses of these islands. The ground hazard areas from either North or East islands would include Sand Island. The open uninhabited land uses associated with this island would be compatible with the required safety areas. Restricted access to Sand Island would only occur up to 2 hours per year. Access to East and Sand islands could be restricted for up to days per year for pre-launch activities.

4.3.2.8.2.2 Recreation

There are no public recreation activities at Johnston Atoll since access to the site is restricted. The activation of the ground and launch hazard areas would temporarily restrict access to the waters around portions of Johnston Atoll, limiting some recreational opportunities for the personnel stationed on Johnston Island. However, other areas would be available for use, and the restriction would be temporary. *Ciguatera* outbreaks, if they occurred, could have a negative impact on sport fishing.

Overall, there would be no adverse impacts to land use from implementation of the Proposed Action.

In terms of the potential for cumulative impacts, the change of the land use from open to a missile testing and training area would limit any future development on North and East islands and cumulatively change the overall land use from its current open conditions. This development, along with the development of Johnston Atoll, has resulted in a cumulative change of the use of the atoll from a natural open environment to one of military uses. Access to Johnston Atoll is restricted for government operations the Proposed Action would not change this status.

No mitigation measures for land use and recreation are proposed.

4.3.2.9 Noise— Johnston Atoll

4.3.2.9.1 No-action Alternative— Noise, Johnston Atoll

Under the No-action Alternative, ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on the noise environment of Johnston Atoll.

There are no cumulative impacts to noise at Johnston Atoll.

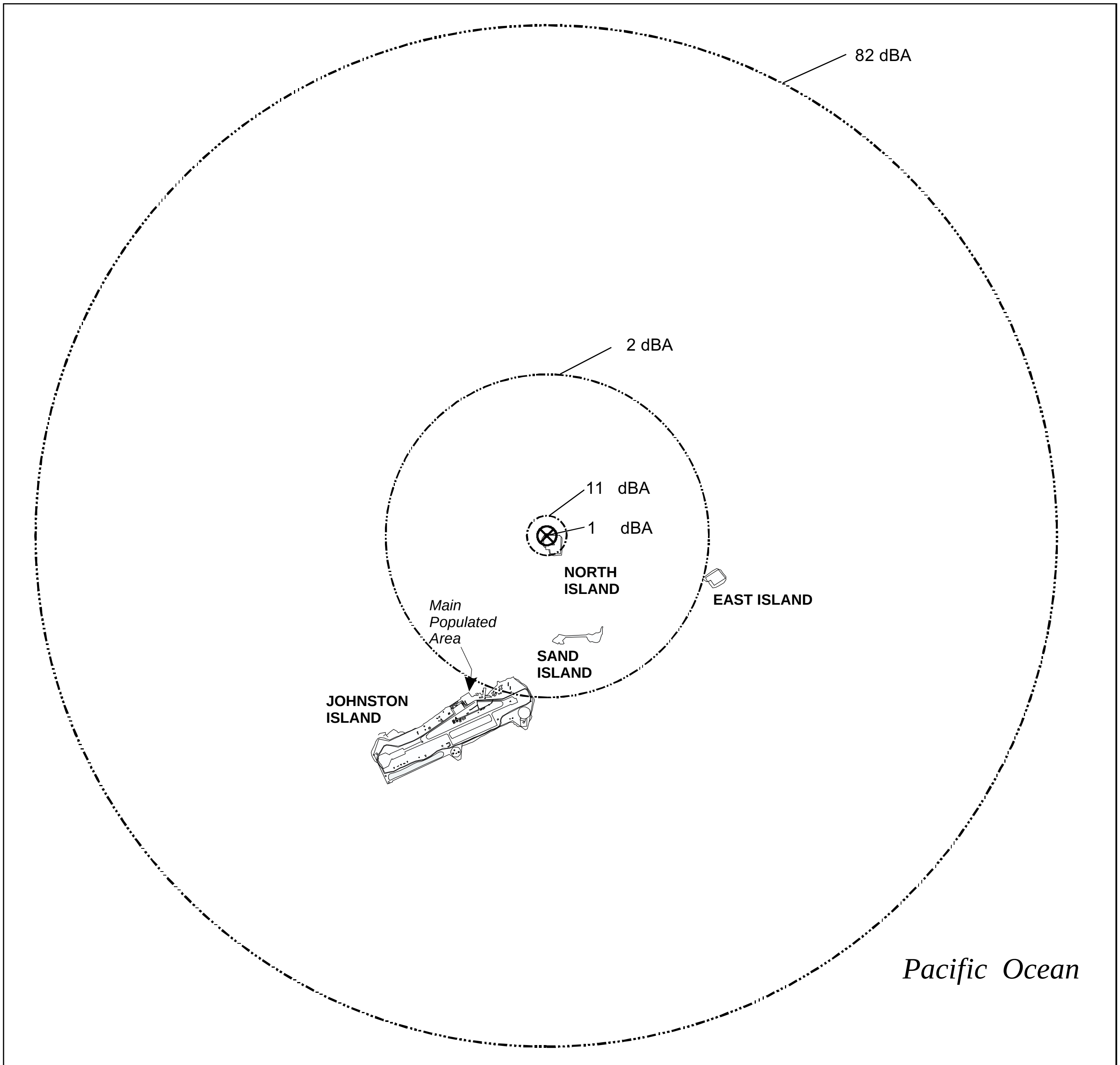
No mitigation measures for noise are proposed.

4.3.2.9.2 Proposed Action— Noise, Johnston Atoll

Under the Proposed Action, potential new noise sources on North or East islands would be associated with temporary site construction, portable generators used during operations, from MATSS and its tug, and target system missile launches. No launches would occur from Johnston Island, which would provide mostly administrative support function for personnel involved in PMRF activities. Currently, there are no personnel located on either North or East islands. The primary impact would be on the local bird population, as discussed in detail in the biological resources section.

Construction-related noise would be temporary in nature and occur during the day. The noise levels generated from these activities would be similar to any small construction pro ect. Since most construction would consist of adding dredge material to the island and erecting either a rail launcher or a radar/telemetry facility, the overall length of activities should be less than months. Portable generators would only be operated during range operations. These operations would consists of up to four launches per year, and if a radar is installed, use of that facility to support launch activities in the area.

Under the Proposed Action, potential target system launch locations could be developed on either North or East islands. It is expected that no more than four target launches would occur per year from either location. The maximum expected noise levels would be 1   dBA at 32 m (1   ft), 11 dBA at 3   m (1,23 ft), 2 dBA at 3, 3 m (,   1 ft), and 82 dBA at ,   m (31, 1 ft) from the launch point. Figures .3.2. -1 and .3.2. -2 provide the expected noise contours ~~from either~~ for North and East islands respectively. None of the noise levels outside of the ground hazard area where non-essential personnel are excluded would exceed either DOD or OSHA safety requirements. Personnel within the ground hazard area wear hearing protection devices. Personnel on Johnston Island would be warned of the launch time and, therefore, should not be startled by the noise. The potentialeffects of atmospheric conditions on noise levels and noise from a flight termination is addressed underthe PMRF section .1.1. , Noise.



Source: Modified from U.S. Department of the Interior, 1 3, p. . 158

EXPLANATION

82 dBA (, meters)
2 dBA (3, 3 meters)
11 dBA (3 meters)
1 dBA (32 meters)
Launch Site

dBA A-weighted Decibel

Scale
1, 3 2,8 2 Meters
, 11 , 23 Feet

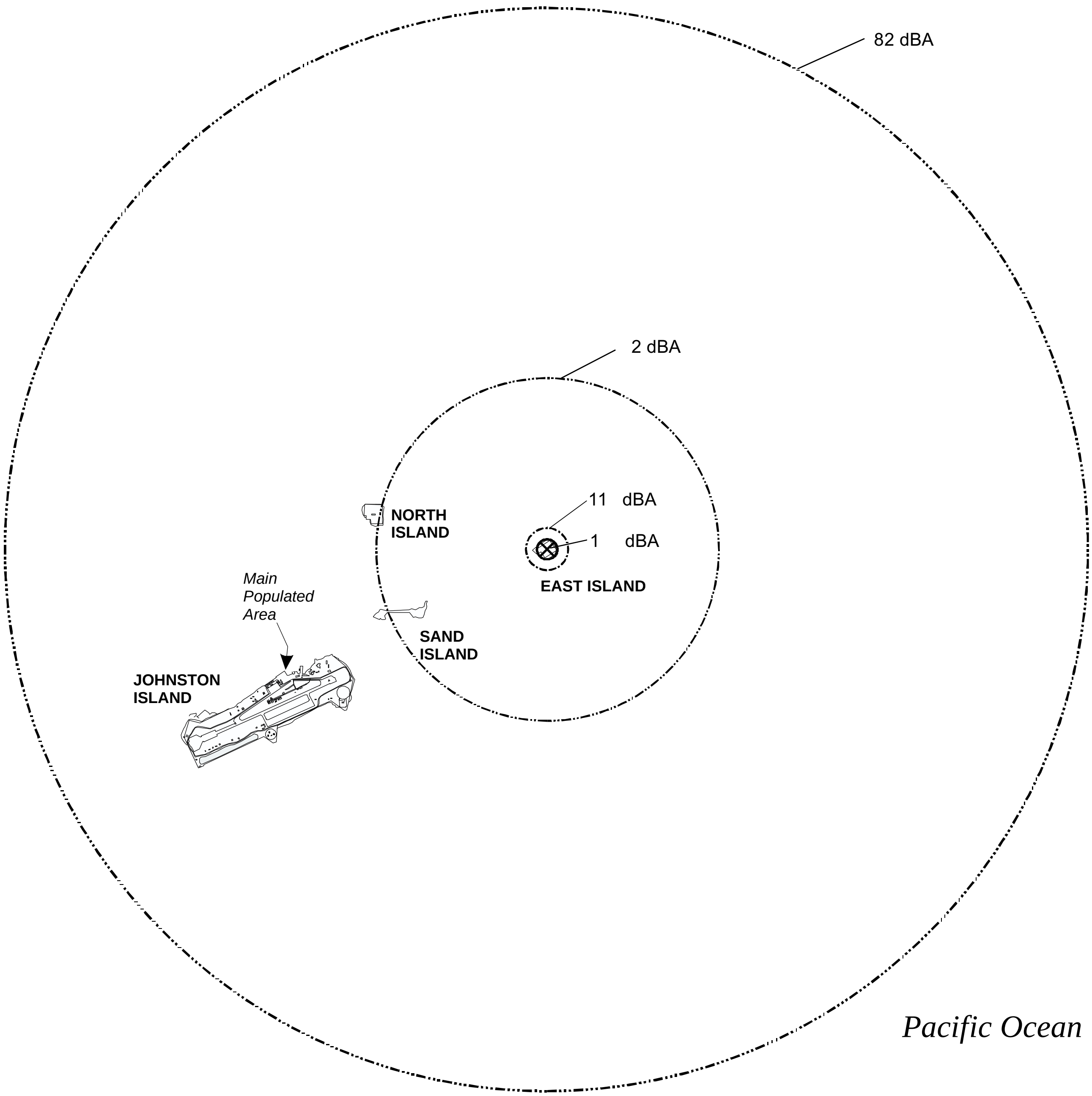
NORTH

Maximum Expected Noise Levels (dBA) at North Island, Potential Site

Johnston Atoll

Figure 4.3.2.9-1

ohnston ns 1



Source: Modified from U.S. Department of the Interior, 1 3, p. .

158

EXPLANATION

82 dBA (, meters)
2 dBA (3, 3 meters)
11 dBA (3 meters)
1 dBA (32 meters)
Launch Site

dBA A-weighted Decibel

NORTH

Scale
1, 3 2,8 2 Meters
, 11 , 23 Feet

Maximum Expected Noise Levels (dBA) at East Island, Potential Site

Johnston Atoll

Figure 4.3.2.9-2

ohnston ns 2

Assuming a 3, -horsepower engine for the tug, the noise generated by the intake, exhaust, and casing radiation is estimated to be dB at a distance of 1 m (ft) (Collier, 1 , p. 3). Generators, depending on the individual manufacturer and model could be expected 1
to generate noise levels of between 1 and 82dBA at 1 m (ft) (U.S. Environmental Protection Agency, 1 1, p.11). 1 3

Sonic booms generated from launches from either North or East islands would occur over the open water and would not impact Johnston Atoll. As discussed in sections .2.1. .2, .2.1. .2, and .3.1. .2, both carpet and focused sonic booms may be generated from the launch of a target missile. Carpet sonic booms may have overpressures from . to 2 psf and extend to as much as 1 km (mi) on either side of the ground track of the missile s tra ectory. The focused sonic boom may have a maximum peak overpressure of . psf. Depending largely on the missile s tra ectory, these sonic booms may occur tens of kilometers downrange from the launch site. The primary impact from the sonic booms would be on the local bird population, as discussed in the biological resources section.

In terms of the potential for cumulative impacts, the noise environment on North and East islands and the surrounding area mostly consists of natural noises except for Johnston Island. The increased activities would result in up to four launches per year from this area. Although PMRF operations would be infrequent on the island, the noise generated under the Proposed Action would involve a new source not normally heard in this area. However, given the few expected launch operations and other activities, ambient noise levels are not expected to substantially increase over baseline conditions

No mitigation measures for noise are proposed.

4.3.2.10 Transportation— Johnston Atoll

4.3.2.10.1 No-action Alternative— Transportation, Johnston Atoll

Ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on transportation. Personnel are transferred to and between the islands by landing craft or Boston whaler.

No adverse cumulative impacts would result from the No-action Alternative.

No mitigation measures for transportation are proposed.

4.3.2.10.2 Proposed Action— Transportation, Johnston Atoll

The existing transportation system would be used. Activities would result in additional flights to the island. No adverse impacts are expected.

No adverse cumulative impacts are expected.

No mitigation measures for transportation are proposed.

4.3.2.11 Utilities— Johnston Atoll

4.3.2.11.1 No-action Alternative— Utilities, Johnston Atoll

Ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on utilities. Personnel are accommodated overnight in existing housing on Johnston Island.

No adverse cumulative impacts would result from the No-action Alternative.

No mitigation measures for utilities are proposed.

4.3.2.11.2 Proposed Action— Utilities, Johnston Atoll

The existing fresh water, electrical, and sanitation systems would be used to support launch personnel on Johnston Island. Proposed facilities required for Sand, North, and East islands would be self-contained using generator power and portable toilets. Solid waste would be collected and removed from the island. No adverse impacts are expected.

No adverse cumulative impacts are expected.

No mitigation measures for utilities are proposed.

4.3.2.12 Visual and Aesthetic Resources— Johnston Atoll

4.3.2.12.1 No-action Alternative— Visual and Aesthetic Resources, Johnston Atoll

Under the No-action Alternative, ongoing USFWS wildlife monitoring and academic research on the reef and atoll environment would have no impact on the visual and aesthetic resources of Johnston Atoll.

In terms of the potential for cumulative impacts, the modifications and development of facilities to support government operations on Johnston Atoll have cumulatively impacted the original visual environment. As described in the affected environment, the original visual environment of Johnston Atoll has been changed by the addition of dredged material for island expansion and creation of new islands and the development of a military installation on Johnston Island. However, no prominent public view points are obstructed since access to the island is restricted therefore, no impacts would occur.

No mitigation measures for visual and aesthetic resources are proposed.

4.3.2.12.2 Proposed Action— Visual and Aesthetic Resources, Johnston Atoll

Under the Proposed Action, target launch facilities, would be located on North, East Islands with the radar, telemetry, optics, electronic warfare, DGPS, and communication, command, and control facilities on Sand island or on the MATSS moored off Sand Island. No new facilities would be required for Johnston Island.

The proposed facilities at North, East, and Sand islands would not contrast with the developed man-made nature of Johnston Atoll. Because North, East, and Sand islands already contain facilities and the nearby Johnston Island is heavily developed, the proposed facilities would not be out of character with the existing military nature of the visual environment. In addition, no prominent vistas would be obstructed since public access to the island is restricted therefore, no impacts would occur.

~~In terms of the potential for cumulative impacts, as discussed under the No-action Alternative,~~ T~~t~~he past modifications and development of facilities to support government operations on Johnston Atoll have cumulatively impacted the original visual environment, including the construction of the man-made islands of North and East. The addition of the proposed facilities would further alter the visual environment. However, no prominent public view points are obstructed since access to the island is restricted.

No mitigation measures for visual and aesthetic resources are proposed.

4.3.2.13 Water Resources— Johnston Atoll

4.3.2.13.1 No-action Alternative— Water Resources, Johnston Atoll

No adverse impacts to water resources are expected from ongoing USFWS and academic research activities.

4.3.2.13.2 Proposed Action— Water Resources, Johnston Atoll

Potential impacts that could result from proposed construction activities at Johnston Atoll include increased turbidity and contamination of surface waters. Impacts could also result from launch-related activities such as changes in water chemistry due to deposition of launch emissions, chemical simulants, and missile debris.

4.3.2.13.2.1 Construction Activities

Construction activities at potential launch and instrumentation sites on Johnston Atoll would involve routine construction activities including earthwork, concrete forming and working, and small building construction. These operations are routinely accomplished in both military and civilian construction operations, and would follow standard engineering techniques to control erosion. Surface drainage would not be substantially modified.

Construction activities for one target launch site would result in a disturbance of approximately .3 ha (. ac) of land, and an instrumentation site of approximately .2 ha (. ac). Assuming one target launch site and two instrumentation sites, less than 2 ha (ac) would be disturbed~~,~~ ~~and the~~ C~~c~~onstruction would not be sub ect to NPDES permitting requirements.

4.3.2.13.2.2 Flight Test Activities

Surface Water

Impacts to surface waters within the Johnston Atoll region of influence would be primarily associated with combustion emissions deposition in near-shore ocean waters. Combustion emissions are composed primarily of hydrogen chloride, aluminum oxide, and water. Although hydrogen chloride is very soluble in water, it does not deposit readily onto dry aerosols or other dry surfaces when the relative humidity is below 1 percent. Because the atmosphere under launch conditions when there is no rain for 2 hours after the event would have a relative humidity lower than 1 percent, direct dry deposition of hydrogen chloride gas onto the ground and vegetation would not be significant. Similarly, the deposition of aluminum oxide would be very low. Section .2.1 (Niihau) contains a discussion of the potential deposition associated with target missile launches.

Impacts to water resources could also occur from ~~solid rocket motor (~~SRM~~)~~ propellants following a flight termination. Section .2.1.1 .2 (Niihau), includes a complete discussion of SRM propellants. In summary, the solid rocket motors proposed for use in both the interceptor and target missiles would consist primarily of AP and an HTPB binder. Based on the findings of several previous studies (U.S. Air Force, 1 8 , Oct, p.2 Air Force Wright Aeronautical 12
Laboratories~~AFWAL~~, 1 8 , Oct, p.22 through 3 Moscow Department of Public Sanitation, 1
1 , 2 Sep, p.3 through U.S. Air Force, 1 83, p. 3 through Alcorn State University, , 123
1 , 1 Jun, p.2 through 2), AP would not result in appreciable changes in marine water 2
chemistry (i.e., pH, BOD, and nitrogen levels). In addition, changes in chloride levels resulting from AP deposition in seawater would not be significant in nature (Boyer, 1 , Jul). 1

Because the HTPB binding agent is essentially insoluble in water and does not seem to have an appreciable toxicity for aquatic organisms, concerns regarding increased toxicity levels would be primarily associated with that of AP. However, any AP leaching from the binding agent would disperse quickly and would be diluted and neutralized by the natural buffering capacity of the sea. Even in the most conservative analysis involving the impact of a fully loaded vehicle in the ocean environment, the volume of AP involved is small and the effects are not considered persistent. As a result, potentially toxic concentrations within more than a few meters of the propellant would not be anticipated (National Aeronautics and Space Administration, 1 3, Jul, p.3 Kataoka, 1 , Jun). 3, 3

The corrosion of missile hardware within an aqueous environment would contribute various metal ions to the surrounding environment. The rate of corrosion of such materials is slow in comparison to the mixing and dilution rates in the water environment, and hence, toxic concentrations of metal ions will not result. The miscellaneous materials (e.g., battery electrolytes) are present in such small quantities that only extremely localized and temporary effects would be anticipated.

There would be no water resources impacts from operating the MATSS at Johnston Atoll. The gray and black water waste will be stored onboard for the duration of an operation. The gray water tank, like the black water tank, is contained within thetankage space below the Machinery Space. Provision has been made to be able to pump the waste water to a standard fitting on the hull of the vessel for offloading to a sewage barge at the Naval Inactive Ship Maintenance Facility in Pearl Harbor following the operation.

Groundwater

Potable groundwater within the region of influence is very limited. Measurable groundwater contamination as a result of launch activities is highly unlikely because of the limited quantities of missile exhaust emissions that would reach the ground, and the standard spill prevention, containment, and transportation safety plans that would be implemented.

In terms of the potential for cumulative impacts, direct and indirect impacts to water resources are not expected to result in substantial long-term changes in water chemistry, degradation of potable water sources, or substantially diminished aquatic habitat value. No other activities have been identified at Johnston Atoll that, when combined with the Proposed Action, would result in cumulative impacts to water resources.

No mitigation measures for water resources are proposed.

4.4 OCEAN AREA (OUTSIDE U.S. TERRITORY)

The ongoing, continuing Fleet Training Exercises conducted at PMRF would have no impact on air quality, cultural resources, geology and soils, hazardous materials and hazardous waste, land use, noise, transportation,socioeconomics, utilities, or visual and aesthetic resources in the ocean area region of influence. Air quality would not be impacted because the exercises take place over a broad ocean area, are intermittent, and the sources of potential air pollutants are mobile rather than stationary point sources, so that any emissions would be quickly dispersed by prevailing winds. Cultural resources and geology and soils would not be impacted because the exercises take place largely in the deep ocean environment with no known cultural resources, including underwater archaeological resources~~present,~~ and no potential for impacts to geology and soils. Hazardous materials management and handling, as well as waste generation practices, would not be impacted by Fleet Training Exercise in the Ocean Area. All activities associated with use of hazardous materials would be performed prior to putting to sea. No conflicts with land use plans, policies, and controls would exist with activities in the broad ocean area.

Fleet Training Exercises would create noise (addressed in section . .1.2), but no relevant noise emission standards exist, and land use-compatibility guidelines are not relevant in the open ocean environment. Waterborne transportation would not be impacted by ongoing activities. Before any hazardous exercise or operation is allowed to proceed, the Range Control office using PMRF assets is solely responsible for determining range status and setting RED (no firing) and GREEN (range is clear and support units are ready to begin the event) range firing conditions. The ocean area would be verified clear of any surface ships before exercises begin, thus ensuring no impacts to surface shipping. Any socioeconomic impacts as a result of any direct, indirect, or induced employment generated by the ongoing, continuing Fleet Training Exercises would be felt in communities ad acent to the Naval bases and contractor facilities, not in the ocean area. Similarly, any utility impacts would manifest themselves in the Naval bases and contractor facilities involved. There are no pertinent visual or aesthetic resource values in the ocean area, noviewsheds or relevant observer positions since the exercises take place well away from land, and thus no potential for visual and aesthetic resource impacts.

The potential for impacts to airspace use, biological resources, health and safety, and water resources in the Ocean Area region of influence from ongoing, continuing Fleet Training Exercises does exist and is discussed below by environmental resource category.

4.4.1 NO-ACTION ALTERNATIVE— OCEAN AREA (OUTSIDE U.S. TERRITORY)

4.4.1.1 Airspace Use— Ocean Area (Outside U.S. Territory)

4.4.1.1.1 Controlled and Uncontrolled Airspace

The ongoing, continuing Fleet Training Exercises, including missile training air operations gunnery bombing mining and electronic warfare exercises the Aerial Target and Missile Operations and the Strategic Target System, Sandia Rocket Target, and Kauai Test Facility launch programs would continue to utilize the existing over-water special use airspace. No new special use airspace proposal or any modification to the existing special use airspace is contemplated to accommodate continuing mission activities. Consequently, no impacts to the controlled and uncontrolled airspace in the open ocean region of influence would result from the No-action Alternative.

4.4.1.1.2 Special Use Airspace

Ongoing, continuing exercises and activities identified above would continue to utilize the existing overwater special use airspace. Although the nature and intensity of utilization varies over time and by individual special use airspace area, the continuing mission activities represent precisely the kinds of activities for which the overwater special use airspace was created. The Warning Areas were set aside in the 1 s by the FAA to accommodate activities that present a hazard to other aircraft. Warning Areas consist of airspace over international waters in which hazardous activity may be conducted. This designation corresponds to the Danger Area designation of ICAO. As such, the continuing mission activities do not represent an adverse impact to special use airspace and do not conflict with any airspace use plans, policies, and controls.

4.4.1.1.3 En Route Airways and Jet Routes

Although relatively remote from the ma ority of et routes that crisscross the northern Pacific, two IFR en route low altitude airways and two IFR en route high altitude et routes are used by commercial aircraft that pass through the region of influence (see figure 3. .1-2). The two low altitude airways are: V1 that passes east to west through the southernmost part of Warning Area W-188, and V-1 that passes east to west through the northern part of Warning Area W-18 . The two high altitude et routes are: A to the west of Kauai, and R 8 to the southwest of Kauai. However, use of these low altitude airways and high altitude et routes comes under the control of the Honolulu and Oakland ARTCCs. In addition, provision is made for surveillance of the affected airspace either by radar or patrol aircraft. Safety regulations dictate that hazardous operations would be suspended when it is known that any non-participating aircraft has entered any part of the Danger one until the non-participating entrant has left the area or a thorough check of the suspected area has been performed. Consequently, no adverse impacts to the region of influence s airways and et routes would ensue.

In terms of potential airspace use impacts to en route airways and et routes, the continuing mission activities would be in compliance with DOD Directive .1, as directed by

OPNAVINST 3 . A, which specifies procedures for conducting aircraft operations and for missile/pro ectile firing, namely the missile and pro ectile firing areas shall be selected so that tra ectories are clear of established oceanic air routes or areas of known surface or air activity. In addition, before conducting an operation that is hazardous to non-participating aircraft, NOTAMs would be sent in accordance with the conditions of the directive specified in OPNAVINST 3 21.2 A. The widespread adoption of Free Flight by commercial aircraft in the early years of the next century could make the task somewhat more difficult, but this eventually would still be handled by the issuance ofNOTAMs.

All airspace outside the ~~22.2-km (12-nautical-mi)~~territorial limits ~~limit~~ is located in international airspace. Because the open ocean airspace use region of influence is in international airspace, the procedures of the ICAO, outlined in ICAO Document ,*Rules of the Air and Air Traffic Services*, are followed. ICAO Document is the equivalent air traffic control manual to the FAA Handbook 11 . ,*Air Traffic Control*. The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the over-water region of influence is managed by the Honolulu ARTCC, and the Oakland ARTCC.

As noted above, continuing mission activities would continue to utilize the existingoverwater special use airspace and would not require either: (1) a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure or (2) a VFR operation to change from a regular flight course or altitude. Consequently, no impacts to the surrounding low altitude airways or high altitude et routes would occur from the No-action Alternative.

4.4.1.1.4 Airports and Airfields

There are no airports and airfields in the Ocean Area region of influence. Consequently, the No-action Alternative would have no impacts on airfields and airports.

In terms of the potential for cumulative impacts, all ongoing, continuing Fleet Training airspace use activities would take place in existing special use airspace that has been in existence since the early 1 s, and which is cleared of non-participating aircraft. The required scheduling process for use of this airspace would obviate the potential for adverse cumulative impacts.

In terms of mitigation measures, the well defined special use airspace dimensions and scheduled time of use on aeronautical charts, in addition to the positive air traffic control by the Honolulu and Oakland ARTCCs, obviate the need for mitigation measures.

4.4.1.2 Biological Resources— Ocean Area (Outside U.S. Territory)

The ongoing, continuing Fleet Training Exercises conducted at PMRF would have no discernible or measurable effect on the ocean s overall physical and chemical properties, (such as its salinity, density, temperature, acidity (pH), or mix of dissolved gases) and thus would have no impacts on the overall marine biology of the Ocean Area region of influence. Moreover, the exercises would have no discernible effect on the biological diversity of either the pelagic or benthic marine environments. The vast ma ority of exercises takes place far removed from land, in the open ocean, or pelagic zone, which contains approximately 2 percent of marine species (Hickman, Roberts, and Hickman, 3

1 , p.12). While the exercises would have no discernible or measurable impact on phytoplankton or zooplankton in the pelagic zone, the potential exists for impacts to nekton organisms, as most species of nektonic animals live near the sea surface. 3

Acoustic emissions from various systems and activities could affect marine mammal hearing. Most large mysticete whales are presumed to hear best in the lower frequencies (1 - 2, Hz) where they emit sounds, while the smaller toothed (odontocete) whales and dolphins hear and emit at the higher frequency ranges (1 - 1 kHz). The NMFS has the regulatory authority necessary to ensure compliance with the Marine Mammal Protection Act. NMFS has indicated that TTS, a temporary reversible decrease in hearing sensitivity resulting from exposure to loud sound, is a potential measure for evaluation of the impacts of noise on marine mammals.

There is little existing scientific literature about TTS and marine mammals. The ONR is currently sponsoring work to measure threshold shifts in representative seals and sea lions, dolphins, and small whales, but data has not completed peer-review. New techniques for examining hearing sensitivities of both small and large whales, including Acoustic Evoked Potentials, Envelope Following Responses, and Otoacoustic Emissions, are currently under examination. Hearing tests of dolphins and small whales (e.g. Au, Nachtigall and Pawloski, 1
1) indicate that most toothed whales will probably not be affected by low frequency sounds less than 1 dB and below 1 kHz, but sounds between 1 kHz and 1 kHz will be of particular concern. Larger baleen and mysticete whales are likely sensitive to lower frequencies based on the sounds that they produce. No firm data are yet available for actual hearing measurements of the large whales, but the above mentioned new techniques will be applied to opportunistically test the hearing of these whales in the future.

Current information on the effects of sound on marine mammals is incomplete, but that information is relevant to reasonably evaluating foreseeable significant adverse impacts. The Navy desires to address this issue and has undertaken a systematic study to examine the effects of acoustic emissions on marine mammals. One recent study by Ridgway and his colleagues at SPAWARS SCEN in San Diego has been developing a technique to examine TTS in trained Navy dolphins. This study is a pioneering effort in the examination of TTS. TTS is dependent on the duration of the signal and repeated exposures. Thus far, emissions of only one second duration have been used. The data were also found to be highly dependent on the incidence angle and would most likely vary with amplitude of the signal, duration of the signal, frequency of the signal, and time between exposures. Data from this study are breaking new ground, but were limited to the bottlenose dolphin.

Additional ONR-funded work is examining TTS on California sea lions, elephant seals, and harbor seals performing more complete work on the bottlenose dolphin and developing new procedures for testing marine mammal hearing. The Navy is also developing long-term research plans that will stress the quantification of exposure of additional species to acoustic emissions with differing experimental approaches and detailed observations of effects. Preliminary studies are also currently being conducted to assess potential impacts of low-frequency sonar operations on marine mammals in the wild.

Once these studies are completed, the Navy, in consultation with NMFS, will incorporate the results in relevant future NEPA analyses and documents as well as consider the potential for effects on ongoing activities. In the meantime, relevant scientific information remains sparse. A large degree of uncertainty exists about the effects of loud sounds on marine mammals. Precise and meaningful conclusions are not currently available for inclusion in this document.

The following sections rely heavily on the 1 *Report on Military Activities in Hawaiian Waters* (U.S. Department of the Navy, 1 , 21 April), which describes both the individual Fleet 1
Training Exercises and the potential for impacts to humpback whales. The potential for impacts from miscellaneous exercises and for those portions of various RDT E activities conducted in the ocean area is also discussed.

4.4.1.2.1 Missile Training Exercises

4.4.1.2.1.1 Launches of Target Drones and Missiles from Shore

Supersonic (non-recoverable) and subsonic (recoverable) drones are launched from PMRF/Main Base downrange into Warning Areas W-18 and W-188 as targets for surface ship anti-air warfare training. Warning Areas W-188 and W-18 are generally used by PMRF/Main Base as the downrange areas for any launches of drones. The drones are launched from locations within the confines of the PMRF shore-based complex. The actual area for engaging the drone as a target is well outside the 183-m (1 -fathom) isobath. Upon completion of the exercise, recoverable drones are flown back toward PMRF/Main Base, where they land in the water for retrieval by a recovery vessel.

During launch of some drones, spent boosters may be ettisoned in the vicinity of launch and may land in the water. Depending upon the needed training, the drone s flight path can include high altitude (, to 1 ,2 m 2 , to , ft), low altitude (under 3 .8 m 1, ft), or both.

Upon acquiring the target drone, the ship will launch its surface-to-air missile (SAM). Most but not all SAMs used at PMRF have telemetry warheads and do not explode. Relatively few missiles actually hit a drone. If a missile does hit a drone, the pieces of both fall into the sea. In the rare event that a live warhead is used, the warhead would detonate in close proximity to the target, and small pieces of both would fall into the sea. Most missiles that do not strike the target or detonate are destroyed by command and fall in small pieces to the sea. Missiles that are not ordered destroyed assume a ballistic profile and fall into the sea, either intact or in pieces if the sea surface triggers the proximity fuse.

The potential for any harm to marine mammals from drones or the expended ship missiles is very remote. The range clearance procedures are the same as those required for any ordnance expended at PMRF. The drones are used under very controlled range clearance procedures to ensure that unauthorized vessels, aircraft, and marine mammals, particularly whales, are not present. These involve, at a minimum, a detailed radar and visual search of the range by recovery vessels and range controllers. This information is supplemented by the passive hydrophone array operated by PMRF. Range clearance also frequently includes air reconnaissance flown by helicopters or fixed wing aircraft when available to further assist in determining that the range is clear.

No drones or missiles are fired until the range is clear. The exacting range clearance procedures of PMRF make it highly unlikely that marine mammals, particularly a whale, could remain on the range undetected for very long. All observers are in continuous communications and have the capability to immediately stop the operations. An exercise is immediately halted if the range is fouled by a whale or a vessel. For a marine mammal or whale to be in ured, it would have to enter the range undetected and then surface at the exact point where a booster, spent missile, or spent drone landed. A marine mammal might momentarily change its behavior if overflown by a drone at low altitude, but this effect would be a random, transitory event. There is no information presently available which indicates any indirect or cumulative impacts from this activity.

4.4.1.2.1.2 Launches of Target Drones from MATSS

The impacts in the open ocean area would be essentially the same as those identified above for target drones launched from shore.

4.4.1.2.1.3 Live Missile Firings by Aircraft Versus Target Drones

Live firings of air-to-air missiles are conducted in Warning Areas W-18 and W-188 to the west and northwest of PMRF/Main Base. The aircraft will launch from either the airfield at PMRF/Main Base, a military airfield on Oahu, or a transient aircraft carrier. The aircraft will transit to the assigned warning areas typically at an altitude in excess of 3 8 m (1 , ft), although occasionally a lower altitude may be used. The aircraft will orbit at altitude until the drone is launched from PMRF/Main Base. After launch, the rocket or drone will climb to an altitude and fly a preset attack profile. The aircraft will acquire the target with its weapon systems and launch the missile upon obtaining a firing solution. The air-to-air live missile will seek its target and detonate when within a preset distance of the drone. If the missile misses the target, it will either self-destruct or fall to the ocean upon depletion of its fuel.

Air-to-surface missile targets include both SEPTARS and an approved old vessel hulk that has been cleaned to eliminate environmental contamination. SEPTARS are deployed from shore and can be directed into the firing area by remote control. If the target hulk is used, it is towed out to the designated point on the PMRF range. PMRF Range Clearance procedures are used to determine that no marine mammals, vessels, or aircraft are on the range. Aircraft are then permitted to engage the target. The missiles are then guided to the target. Explosive warheads are used very infrequently (less than one per year). Inert air-to-surface missiles are used two or three times per year.

Air-to-surface missiles extremely rarely (less than once per year) may carry explosive warheads (warshots) that are fired for test and evaluation. Such test and evaluation exercises are even more carefully controlled in order to ensure safety and obtain valid data. Given their tight control and the infrequent conduct of shots involving warshots, the risk to marine mammals and humpback whales is extraordinarily remote.

Live air-to-air missiles are fired under very controlled circumstances to determine safety and to obtain valid data. The detailed range clearance procedures determinethat marine mammals, particularly whales are not present. These involve, at a minimum, a detailed visual search of the range from recovery vessels, and range controllers supplemented by passive sonar information from the hydrophones. They are frequently supplemented by air reconnaissance flown by helicopter and fixed-wing aircraft when available to further determine the range is clear. Targets and missiles are not fired until the range is determined clear, and an exercise is immediately halted if the range is fouled by a whale or a vessel (e.g., a whale or vessel is detected in the area). The aircraft, the target and all observers are in continuous communications and have the capability to immediately stop operations.

All missile firings occur at PMRF outside the 183-m (1 -fathom) isobath. PMRF strictly controls weapons firings and does not permit an exercise to proceed until the range is declared clear after consideration of inputs from visual surveillance of the range from aircraft and range safety boats, radar data, acoustic information from a comprehensive system of sensors and surveillance from shore. The exercise can be modified as necessary to obtain a clear down range or it is canceled. Under these conditions, the chance of any direct, indirect, or cumulative impact is highly unlikely.

Anti-Surface Warfare Exercises

Anti-Surface Warfare exercises involve ship maneuvering, deployment of countermeasures, and firing missiles against simulated targets. A variety of missiles may be used, including missiles like the Harpoon that is specifically designed for attacking ships. The simulated targets may be self-deployed inflatable targets, targets towed by other ships, or remotely controlled target boats. Ships may deploy devices to decoy or deceive other surface ships or their weapons. One decoy used most frequently is chaff metallic coated strips or particles that are dispersed in the air to decoy radar-guided missiles.

Anti-surface warfare missile exercises in the vicinity of the Hawaiian Islands must occur in one of the designated operating areas. Areas are assigned and the drills are conducted so that the fall of missiles occurs within the assigned area. All anti-surface warfare missile exercises involving remotely controlled target boats occur in operation areas near PMRF. PMRF is used for such anti-surface warfare exercises between 2 to 2 times each year.

Missile exercises pose few additional risks to marine mammals beyond ordinary ship operations, which are themselves very slight. The risk of harmful effects to marine mammals and humpback whales is remote because of the safety procedures utilized and the very limited area where the weapons used could harm a whale. The Navy has not observed any harmful effects on marine mammals from anti-surface warfare missile operations nor does it anticipate any indirect or cumulative effects.

Exercises where missile are fired occur in a very controlled environment where safety is paramount. No firing is permitted until after it is determined that the range is clear. Many surface ships have electrically-enhanced optics (essentially sophisticated television cameras) that permit search and identification beyond normal visual ranges. Embarked helicopters are also frequently used to further examine the range to determine that no other surface craft or marine mammals are present. Each surface ship has a safety observer who determines that the range is clear before and during the exercise and who can halt the exercise if whales are observed.

The range safety precautions at PMRF are even more rigorous because of the extra sensors available. Exercises involving missiles or target boats are all conducted at PMRF. PMRF strictly controls weapons firings and does not permit an exercise to proceed until the range is determined clear after consideration of inputs from ships sensors, visual surveillance of the range from aircraft and range safety boats, radar data, acoustic information from a comprehensive system of sensors and surveillance from shore. The exercise can be modified as necessary to obtain a clear range or is canceled.

When missiles are used for anti-surface warfare exercises, they are usually fitted with telemetry warheads instead of explosive warheads. Some missiles used for these exercises are primarily designed for use against aircraft and carry relatively small explosive charges. Harpoon missiles do carry warheads of 1 3.3 kg (3 lb), but burst at or above the surface of the water and pose much less risk to a submerged marine mammal than a similar explosive charge at a greater depth. The area where a marine mammal would be harmed is relatively small, and given the elaborate range safety measures and the small number of such weapons used (generally less than 1 per year), the risk is extremely small.

Target boats are fairly small (approximately . to .1 m 1 to 3 ft long). They are remotely controlled and can be maneuvered to avoid any marine mammals that are detected on the range. The risk to marine mammals from the target boats at PMRF is low.

4.4.1.2.1.4 Anti-Air Warfare Exercises

Anti-Air Warfare exercises involve equipment maintenance and calibration, ship maneuvering, deployment of countermeasures, and firing missiles against simulated targets and deploying decoys. A variety of missiles may be used, including the Standard missile and the Sea Sparrow. The most common decoy is chaff - metallic coated strips or particles that are dispersed in the air to decoy radar-guided missiles. Flares may also be used. The simulated targets may be sleeves towed by aircraft, drones launched from shore or in very rare cases, starshells fired by a ship.

Subsonic and supersonic target drones are also used. Once the range is determined clear and declared GREEN, the drone is launched toward the general vicinity of the ship. For launch, drones may use boosters. The boosters burn out quickly and are ettisoned within moments of launch. The drone will fly a selected missile profile. Depending upon the needed training, the drone s flight path can include high altitude (, to 1 ,2 m 2 , to , ft), low altitude (under 1 m 2 ft) or both.

Upon acquiring the target drone, the ship will launch its SAM. Relatively few missiles actually hit a drone. If a missile does hit a drone, the pieces of both fall into the sea. In the rare event that a live warhead is used, the warhead will detonate in close proximity to the target and small pieces of both will fall into the sea. Most missiles that do not strike the target or detonate are destroyed by command and fall in small pieces to the sea. Missiles that are not ordered destroyed assume a ballistic profile and fall into the sea, either intact or in pieces if the sea surface triggers the proximity fuse.

Subsonic target drones are flown by remote control back to the waters near PMRF. When the drone runs out of fuel, it is glided i~~o~~nto the water where it floats until a recovery vessel retrieves the drone for reuse. Supersonic drones are not retrievable or reusable. Supersonic drones are lost at sea at the end of their missile profile.

Missile exercises in the vicinity of the Hawaiian Islands must occur in one of the designated operating areas. Areas are assigned and the drills are conducted so that the fall of missiles occurs within the assigned area. All missile exercises involving drones occur in operation areas near PMRF, usually Warning Areas W-188 and W-18 .

Anti-air warfare exercises, even those involving missiles, pose few additional risks to marine mammals beyond ordinary ship operations, which are themselves very slight. The risk of harmful effects on marine mammals is remote because of the safety procedures utilized and the very limited area where the weapons used could harm a marine mammal. The Navy has not observed any harmful effects on marine mammals from anti-air warfare exercises, nor does it anticipate any indirect or cumulative effects.

Exercises where ordnance is expended occur in a very controlled environment where safety is paramount. No missile firing is permitted until after it is determined that the range is clear.

The exacting range clearance procedures of PMRF make it highly unlikely a whale could enter the range undetected. If, however, one did move onto the range, the effect of a drone passing overhead would be transitory. Given the frequency of drone launches, there is no risk of cumulative impacts.

4.4.1.2.2 Air Operations Exercises

4.4.1.2.2.1 Air Combat Maneuvering

Air combat maneuvering is conducted between aircraft at high altitudes (above 3, 8 m 1 , ft) within Warning Areas well outside the limits of the 183-m (1 -fathom) isobath. Approximately two to four aircraft from either a transient aircraft carrier or one of the local military bases will travel at high altitudes to the assigned Warning Area. No ordnance or guns are used. At all times, the aircraft are required to remain above 3, 8 m (1 , ft).

No harm or effect is expected on marine mammals. The aircraft transit and perform air combat maneuvering at high altitudes well above the surface of the ocean. The aircraft generally travel at high enough altitudes that they can not be heard. There are no indirect effects. If a marine mammal were even able to detect these operations, which is doubtful, it would be a transitory experience without any cumulative impacts.

4.4.1.2.3 Gunnery Exercises

4.4.1.2.3.1 Gun Exercises by Aircraft Using Surface Targets or Kaula

Air-to-surface gunnery is infrequently practiced by fixed-wing aircraft (about 3 to days per year at Kaula within Restricted Area R-31 and Warning Area W-18). In contrast, helicopters use this area approximately 3 to days throughout the year for gunnery practice.

For gunnery practice at Kaula, the target is visually cleared by the aircraft by flying over Kaula and determining whether it is safe to complete the mission. Only if the target is clear will the mission continue. Fixed-wing aircraft will go no lower than 1 m (2 ft) duringa gunnery run. Helicopters, after visually clearing the target, will practice with their machine guns. The altitude of the helicopter is no lower than 1 .2 m (ft) but is usually no less than 1 m (2 ft).

The potential for any harm to marine mammals and humpback whales from gunnery practice rounds is very remote. A gunnery practice round does not carry any explosives but does carry the equivalent of a shotgun shell which generates a puff of smoke upon impact for scoring. Aircrews are aware that they are not to harm or harass any marine mammals. As part of the required clearance before a gunnery exercise, they must determine that the area to be gunned is clear, visually and with their sensors, whether atKaula or far out to sea. The lack of an explosive charge, the required clearance, and conducting the ma ority of gunnery runs at either Kaula or the controlled ranges at PMRF keep the risk to marine mammals very remote.

Whenever aircraft use PMRF s range for gunnery practice, the weapons are used under very controlled circumstances that involve range clearance procedures to ensure that marine mammals are not present. These involve, at a minimum, a detailed visual search of the range by aircraft reconnaissance, range safety boats, and range controllers supplemented by radar and the hydrophones on the range. Ordnance cannot be released until the range is determined clear, and operations are immediately halted if the range is fouled by a whale, other marine mammals, or a vessel (e.g., a whale or vessel is detected in the area). All observers are in continuous communications in order to have the capability to immediately stop the operations. The exercise can be modified as necessary to obtain a clear range, or it is canceled. All of these factors serve to avoid the risk of harming marine mammals.

Open ocean clearance procedures are the same for live or inert ordnance. Aircrews are aware that they are not to harm or harass any marine mammals. As part of the required target clearance procedures, they must determine that the area to be gunned is clear, visually and with sensors. Only after the target area is determined clear of vessels, aircraft, and marine mammals, especially whales, can a gunnery operation occur. The verification procedures significantly limit any potential for harm to a marine mammal.

The ordnance used in most gunnery exercises poses a risk to a marine mammals only if the marine mammal were to breach precisely at the point of impact. Both . caliber machines guns and the close-in weapons systems exclusively fire non-explosive ammunition. Thus, exercises using these weapons are of little risk. Even larger weapons generally fire inert or non-fragmenting ordnance for training exercises. These rounds pose a risk only at the point of impact. On those occasions when regular ammunition is used, rounds up to 12. cm (in.) pose a risk to marine mammals only within a very small area because of their size and fusing. Even 12. -cm (-in.) rounds contain less than .1 kg (lb) of explosives. When missiles are used for exercises, they are usually fitted with telemetry warheads instead of explosive warheads. When live warheads are used, the detonation is in the air, posing no risk to marine mammals for most profiles and minimal risk even for very low altitude profiles because of the relatively small explosive charges involved. The only possible risk is in the area immediately beneath the point of detonation.

Any potential effect to a marine mammals from overflight by either a helicopter or fixed-wing aircraft en route to or returning from a target would be transitory. There are no indirect or cumulative effects from the air gunnery exercises.

4.4.1.2.3.2 Army Surface-to-Air Gunnery Exercises

The impacts of these exercises, which involve the qualification of personnel in the use of Gatling gun cannon against aerial towed targets, would essentially be the same as identified above for other gunnery exercises.

4.4.1.2.4 Bombing Exercises

Fixed-wing aircraft practice bombing uses~~ing~~, the vast ma ority of the time, MK practice bombs (inert steel bombs weighing 11 kg 2 lb). Sometimes aircrews must also use larger bombs (113 kg 2 lb and above, explosive weight).

Live bombs are used on a very infrequent basis (2 or 3 days per year) in Warning Area W188. Additional live bombing is performed well out on the high seas away from the sanctuary areas and the Hawaiian Islands, 2 to 3 days per year. Use may increase slightly during ma or exercises similar to RIMPAC.

The potential for any harm to marine mammals from MK- practice bombs is very remote. A MK- practice bomb does not carry any explosives but does carry the equivalent to a shotgun shell which generates a puff of smoke upon impact for scoring. Aircrews are aware that they are not to harm or harass any marine mammals. As part of the required clearance before bombing, they must determined that the area to be bombed is clear, visually and with their sensors. The lack of an explosive charge, the required clearance, and conducting the ma ority of bombing runs at the controlled ranges at PMRF keep the risk to marine mammals very remote.

4.4.1.2.5 Mining Exercises

4.4.1.2.5.1 Aerial Mining Exercises

The aerial mining exercise, a simulation exercise where no actual ordnance is dropped, would have no impact on marine mammals. However, in other mining exercises aircraft-deployed inert mines are used. Once the range is determined clear of marine mammals and unauthorized vessels, the aircraft are permitted to practice dropping inert, practice mines in the required pattern. The inert mines are dropped in water deeper than 183 m (1 fathoms) and are unrecoverable. Sixty to seventy mine shapes are expended annually at PMRF. (U.S. Department of the Navy, 1 , 21 April, p.2) 1

Aircraft using PMRF s range for practice mining use weapons which are all inert and which are used under very controlled circumstances that involve range procedures to ensure that marine mammals are not present. Weapons can not be released until the range is determined clear. Operations are immediately halted if the range is fouled by a marine mammal or a vessel. Aerial mining exercises can be modified as necessary to obtain a clear range, or it is canceled. Additionally, most aircraft weapons operations occur at PMRF outside the 183-m (1 -fathom) isobath, within which the greatest concentration of marine mammals is observed. These range controls are additive factors to ensure that in ury to the marine mammals is very remote. There are no indirect effects. The very small chance of any interaction and the transitory nature of any interaction that would occur preclude cumulative impacts.

4.4.1.2.5.2 Mining Readiness Certification Inspection Exercises

The impacts of these exercises, which involve air dropping of dummy mines equipped with dye packs to show their water impact points, and the use of hovering helicopters over a smoke float to score the exercise, would be similar to those identified above for other mining exercises.

4.4.1.2.6 Electronic Warfare Exercises

The impact of electronic warfare on marine species in general, and marine mammals in particular is not known. That biological systems are sensitive to electromagnetic fields and currents has been known for some time (Wilson, 1 2, 28 Jul). Sharks and rays have 182
specialized sense organs (ampullae) which detect electric fields in the water and hence can orient their swimming. However, whether there are adverse health impacts to marine species from the low levels of electromagnetic radiation emitted from the electronic warfare devices used at PMRF is not known. Studies on the potential impacts of Navy activities to marine species are underway. As these additional Navy studies are completed and consultation with the NMFS is developed, Navy activities at PMRF will comply with the results of the consultation process with NMFS.

4.4.1.2.7 Undersea Warfare Exercises

4.4.1.2.7.1 Air Anti-Submarine Warfare Exercises

Anti-submarine warfare is the primary role for Navy patrol aircraft and anti-submarine warfare helicopters. Anti-submarine warfare aircrews must practice using sensors, including electro-optical devices, radar, magnetic anomaly detectors, sonar (including helicopter dipping sonar and both active and passive sonobuoys) in both the deep and shallow water environment. Magnetic anomaly detection systems and dipping sonar must be employed at low altitude to be effective. Anti-submarine warfare flights occur 1 to 12 times per month but can increase during ma or exercises like RIMPAC when the submarine threat is increased for training purposes.

The PMRF Barking Sands BARSTUR range, outside the 183-m (1 -fathom) isobath, is also routinely used for anti-submarine warfare training.

Anti-submarine missions are either conducted against actual submarines or small remotely piloted underwater vessels that simulate a submerged submarine. The simulators are used at PMRF Barking Sands. Submarines are primarily located either by the noise they produce~~t~~ themselves (passive sonar) or by detecting the reflections they produce when exposed to sound created by another source (active sonar). Both patrol aircraft and helicopters can drop sonobuoys. Sonobuoys are relatively small, cylindrical instruments that are dropped into the sea, conduct a sonar search, and then radio the results back to the aircraft. Helicopters can also lower a sonar transducer into the sea while hovering. Submarines can also be detected by their magnetic signature created by movement through the earth s magnetic field. Magnetic anomaly detectors are installed on both the anti-submarine warfare aircraft and helicopters. This passive device detects any changes in the earth s magnetic waves and is primarily used to localize or confirm suspected submarines first detected through other means.

Passive sonobuoys have the capability to detect acoustic signatures of submarines. Sonobuoys are released either from high or low altitude and enter the water at relatively slow speed as a result of a parachute that retards the vertical drop. Once the buoy enters the water, sea water activates a battery and a hydrophone drops on a thin wire to a preset depth below the floating buoy. The hydrophones can be deployed to depths greater than 183 m (1 fathoms). The acoustic data is radio-relayed back to the aircraft. Various deployment patterns and quantities of sonobuoys are used to localize a submarine depending on the mission, water conditions and the submarine s tactics. After a preset time the buoy floods and sinks to the bottom of the ocean.

Active sonobuoys are deployed similarly from ~~the~~ aircraft. In addition to detecting the noise radiated from a submarine, they also can generate a very low power sonar pulse. They are used much less frequently because they clearly disclose the presence of an anti-submarine warfare aircraft and because the pulse and reflections will also be picked up by the other sonobuoys in the pattern and can interfere with passive detection.

The helicopter s unique capability to hover enables it to use a dipping sonar. The helicopter goes into a stable hover at 1 .2 m (ft) above the water. The sonar transducer is lowered by cable into the water down to depths greater than 183 m (1 fathoms), as needed. The dipping sonar can either be used in an active or passive mode. It has a higher frequency and lower power than ship or submarine sonar. When initially dipped into the water, the anti-submarine warfare operator can detect the presence of vocalizing marine mammals before switching to the active mode.

In support of the anti-surface mission that patrol aircraft and helicopters have also been assigned, PMRF Barking Sands provides air to surface missile targets to hone the skills of aircrews. These targets include both SEPTARS and an old vessel hulk that has been cleaned to eliminate environmental contamination. Once the range is determined cleared in accordance with the PMRF procedures to ensure that no marine mammals, vessels, or aircraft are on the range, aircraft are permitted to engage the target. The missiles are then guided to the target. Explosive warheads are used very infrequently (less than one per year). Inert air to surface missiles are used two or three times per year.

Air-launched inert torpedoes and torpedo shapes (inert and unpropelled) are routinely deployed at PMRF. When the range is determined clear for the exercise, the aircraft is able to release its inert torpedoes. The acoustic locator on the torpedo will allow it to be located and retrieved as it floats to the surface upon completion of its run.

Smoke marker floats are sometimes used to provide a visual reference to aircrews. Smoke markers can be deployed from either a helicopter or aircraft. When the smoke is expended, the casing sinks to the bottom of the ocean. (U.S. Department of the Navy, 1 , 21 Apr, p.33) 1

The potential for aviation ASW operations having harmful effects on marine mammals is extremely small. The Navy has conducted these operations in the Hawaiian Islands for decades and is unaware of any harmful effects on marine mammals. Aircrews are trained to visually scan the surface of the water for anomalies. This training assists in safety clearances for a sonar drop and also trains the crew for visual cues from a submarine, such as shadows and/or periscope, or for detection of enemy small craft. Due in part to this additional emphasis on visual scanning and the availability of extra crew members to conduct such searches, it is unlikely that a marine mammal would be undetected when the aircraft are flying at lower altitudes. If a marine mammal is detected, the flight path can be ad usted to meet the marine mammal avoidance requirements.

The use of sonobuoys is generally limited to areas outside 183 m (1 fathoms). Before dropping sonobuoys, the crew visually determine that the area is clear. Although the altitude at which buoys are dropped varies, the potential for drift during descent generally favors release at lower altitudes, where visual searches for marine mammals are more effective. When the sonobuoy is released, a small parachute retards its entry into the ocean sufficiently that it sinks to less than 3 m (1 ft) upon initial entry before it floats back to the surface. Location of buoy drops, visual search, and the slow rate of descent dramatically reduce the possibility of either in uring or having any effect on marine mammals.

The very low power of the battery-driven active sonobuoy assures that the likelihood of in ury to a marine mammal from the sonar is extraordinarily small. The power is low to begin with, and dissipates rapidly with distance because of the high frequency. The only potential effect would be for the marine mammal to detect this low power pulsed signal and avoid it.

Whenever aircraft use PMRF s range for air anti-submarine warfare exercises with inert torpedoes, the weapons are used under very controlled circumstances that involve range procedures to ensure that marine mammals are not present. These involve, at a minimum, a detailed visual range search by the aircraft releasing the weapon and additional chase aircraft (when available), range safety boats, and range controllers supplemented by radar and the range hydrophone array. Weapons cannot be released until the range is determined clear. Operations are immediately halted if the range is fouled by a marine mammal or a vessel. All observers have the capability to immediately stop the operations. The exercise can be modified as necessary to obtain a clear range, or it is canceled. These range controls are additive factors to ensure that in ury to the marine mammals is very remote. There are no indirect effects. The very small chance of any interaction and the transitory nature of any interaction that would occur precludes cumulative impacts.

4.4.1.2.7.2 Anti-Submarine Warfare Exercises

Surface anti-submarine warfare exercises are necessarily closely related to air and submarine anti-submarine warfare exercises. Surface ships (cruisers, destroyers, and frigates) frequently carry embarked helicopters that work with the surface ship. Surface ships also work with medium and long range patrol aircraft in combined tactics to detect, track, and attack submarines. Anti-submarine warfare exercise training by surface ships also involves submarines, usually as targets but also during coordinated surface and submarine anti-submarine warfare exercises.

Surface ships practice anti-submarine warfare by using a variety of sensors, but primarily active and passive sonars, to locate and track submarines or remotely controlled targets that simulate submarines. To optimize sonar performance, expendable bathythermographs are deployed to measure water temperatures at various depths. Expendablebathythermographs are small canisters that are released from the ship and sink to the bottom, trailing a thin metal wire to transmit information on water conditions back to the ship. Once the information is received (a few minutes), the wire is cut and sinks to the bottom. Once the submarine or target is tracked by passive or active sonar, the ship simulates or actually launches weapons to attach the target. Most surface ship sonars are hull-mounted, but some surface ships tow a long sonar passive array. Exercise weapons consist of ship launched anti-submarine warfare torpedoes with inert warheads. Most exercise torpedoesare designed to be recovered upon completion of the exercise, either by the ship itself or a dedicated recovery craft. Surfaceship anti-submarine warfare exercises are conducted both inside and outside the 183-m (1 - fathom) isobath.

Most anti-submarine warfare training exercises involving the launch of an exercise torpedo occur on the BARSTUR range under range control of PMRF, outside the 183-m (1 -fathom) isobath and well clear of the Hawaiian Islands Marine mammal National Marine Sanctuary boundaries. Surface units conduct anti-submarine warfare training at PMRF approximately 3 to days each year and are scheduled to expend approximately 3 to lightweight anti-submarine warfare torpedoes over the same period. Transiting battle groups also conduct anti-submarine warfare training along their track, which typically lies at least .2 km (2 mi) north of Kauai. Ma or fleet exercises are typically conducted over 8 . km (mi) from any island, but include portions close to land to simulate passage through straits or amphibious operations. Anti-submarine warfare training during these phases must include shallow water operations, and is conducted off PMRF, at the HATS range nearKahoolawe, and in the channel between Kaula and Niihau.

The potential for adverse effects on marine mammals from surface anti-submarine warfare exercises is very remote because of a combination of the nature and intensity of the operations, the equipment, and mitigation procedures. The most serious potential direct effect of surface ship anti-submarine warfare training on marine mammals is collision of a ship and a marine mammal. Depending on the angle of incidence, speed, and depth, such a collision could in ure or kill a marine mammal. The potential for such a collision, however, is extremely remote for a number of reasons. First, surface ship anti-submarine warfare exercises are generally conducted at low to moderate speeds (to 1 knots) because speed quickly degrades sonar performance, whether active or passive. Given the ability of most marine mammals to attain speeds of 2 knots, they are able to avoid collision. Second, during anti-submarine warfare exercises surface ships stress an aggressive posture by lookouts to an even greater extent than usual because of the importance of being able to detect periscopes and other visual indications of submarines. Typically a surface anti-submarine warfare ship will have three lookouts and two officers conducting visual searches that would detect surface marine mammal activity and allow maneuvering to avoid collision. Additional lookouts are often posted in shallow water or proximity to the coast. Some anti-submarine warfare ships supplement lookouts equipped with binoculars with electrically-enhanced optics (essentially sophisticated television cameras) that permit search and identification beyond normal visual ranges.

Anti-submarine warfare-capable ships are also highly maneuverable and during most evolutions are able to maneuver, radically if necessary, to avoid collision. Third, while conducting active sonar searches, surface anti-submarine warfare ships should be readily detectable by marine mammals. Fourth, while conducting passive sonar searches, and to a lesser degree during active sonar searches, surface ships can detect the presence of vocalizing humpback whales, allowing them to alert lookouts and the bridge watch and increase the ability to avoid collisions. As a result of these factors, despite having conducted surface anti-submarine warfare ship operations in Hawaiian waters for years, the Navy is unaware of any collisions between a Navy surface ship and a marine mammal.

A less serious potential effect involves disturbing or changing the behavior pattern of a marine mammal in a harmful way. As addressed above, the lack of collisions between Navy ships and marine mammals may be due in part to the their ability to detect and avoid surface ships a reaction that does not harm the marine mammal. Because Navy ships are not trying to approach or follow marine mammals, these essentially random interactions are brief and unlikely to harm marine mammals because of the small areas affected, the relatively short time frames involved, and the relatively few surface ships at sea in the area at any one time even during ma or exercises.

The use of active sonar during surface ship anti-submarine warfare exercises also could be detected by marine mammals but is unlikely to harm them directly or indirectly. Cruisers and destroyers typically use sonar for active searching that transmits between 3 and kilohertz. Frigates typically employ a sonar that transmits at between . and 8. kilohertz and are of short duration. Sonar signals are pulsed, not continuous. The strength of the signal is attenuated quickly as the range from the ship increases so that even using extremely conservative standards, divers are permitted to work submerged, even in confined harbors, as long as they are more than 8. m (yards) from the sonar. The sonar beam can be focused in different directions rather than beingomni-directional. The area where sound levels exceed other naturally-occurring sounds is relatively small, the duration is limited, and the speed of advance allows avoidance. Active sonars, directed straight ahead at zero depression and low power have been successfully used to alert marine mammals to an approaching ship. Passive sonars, including towed arrays, pose no risk to marine mammals.

The potential for any harm to marine mammals from exercise torpedoes used during surface anti-submarine warfare training is also remote. Exercise torpedoes are fired under very controlled circumstances that involve range procedures to ensure that marine mammals are not present. These involve, at a minimum, a detailed visual search of the range from the ship, supplemented by passive sonar information. They are frequently supplemented by air reconnaissance flown by helicopters when available to further ensure the range is clear. Torpedoes are not fired until the range is determined clear. Most torpedo firings occur at PMRF outside the 183-m (1 -fathom) isobath. PMRF strictly controls weapons firings and does not permit an exercise to proceed until the range is declared clear after consideration of inputs from ships sensors, visual surveillance of the range from aircraft and range safety boats, radar data, acoustic information from a comprehensive system of sensors, and surveillance from shore. The exercise can be modified as necessary to obtain a clear range or is canceled.

Even if marine mammals were on the range, the risk to them is very low. Torpedoes used by surface ships (or their embarked helicopters) do use active sonar to locate targets, but at frequencies that are even higher than surface ships and at less power. Exercise torpedoes are programmed to search within a fairly limited area for to 8 minutes. After their fuel is expended, they are recovered. Exercise torpedoes carry only inert warheads and will not explode. Even though they are inert, exercise torpedoes are set to miss the target to avoid mechanical impacts. On rare occasions, less than one per year, torpedoes with explosive warheads (warshots) are fired for test and evaluation. Such test and evaluationexercises, are even more carefully controlled in order to ensure safety and obtain valid data. Given their tight control and the infrequent conduct of shots involvingwarshots, the risk to marine mammals is extraordinarily remote.

In addition to the specific mitigation measures discussed above, a number of general mitigation measures help ensure that the risk of a harmful effect on marine mammals, particularly humpbacks is extremely low. Since 1 , The Commander Naval Surface Group, Middle Pacific, who is responsible for the operations of surface ships in the Hawaii area when they are not working directly for Commander Third Fleet, has published *The Shipboard Environmental Coordinator's Guide to Environmental Compliance*. That guide informs ships of the NMFS prohibition ~~upon~~of approaching marine mammals. Also, all Navy ships calling on Hawaiian ports are advised of key natural resource issues, including precautions regarding marine mammals, in the reply to their request for a berth. Because this anticipates the actual date of arrival by approximately two days, the ships are advised of humpback precautions well before they approach Hawaii. Commander, Third Fleet Operation Order 2 1, a basic reference for commands planning or conducting operations from ust east of Guam to the West Coast of the United States, describes the sanctuary and the prohibition on taking marine mammals. In addition, there is an annual ship, submarine, and aircraft notice in mid-November announcing the arrival of the marine mammals, reminding them of existing restrictions regarding the humpback whales. This ensures that protection of the humpback whale is officially considered during the planning and conduct of operations, including surfaceship anti-submarine warfare exercises.

Given the nature of anti-submarine warfare exercises and the locations where they take place, even if there are minor direct effects, they are temporary, localized and unlikely to result in either indirect or cumulative effects.

4.4.1.2.7.3 Surface Weapons System Accuracy Tests

The impacts of these tests, which check the accuracy and compatibility of shipboard fire control systems and weapons and typically involve a buoy or an underwater target, would be essentially the same as those identified above for anti-submarine warfare exercises.

4.4.1.2.8 Submarine Operations Exercises

4.4.1.2.8.1 Submarine Warfare Exercises

Anti-submarine warfare remains one of the key roles for Navy submarine forces, requiring constant crew training and equipment maintenance. Submarines are deployed to counter the submarine threat but also to be available for shipping lane control. This second mission requires them to train and develop tactics against surface threats.

To meet these missions, submarines will operate near the coastline for shallow water training discussed in section .1.1.3.1, but also in water deeper than 183 m (1 fathoms).

To enhance a submarine s ability to detect a target, some are equipped with an array of hydrophones that may be towed behind the submarine. The towed linear array significantly enhances the detection and resolution capability of the submarine for both vessels and vocalizing marine mammals. Active sonar is rarely, if ever, used. When conducting operations against other submarines, submarines will fire water slugs from their torpedo tubes to simulate the firing of a torpedo at the other submarine, but no actual torpedoes are shot. A water slug sounds like the mechanical transients made during an actual torpedo launch. The submarine opens the outer door of the torpedo tube and forces the water out of the tube with compressed air.

The most serious potential direct effect of subsurface anti-submarine warfare training on marine mammals is collision of a submarine and a marine mammal. Depending on the angle of incidence, speed and depth, such a collision could in ure or kill a marine mammal. The potential for such a collision, however, is extremely remote for a number of reasons. First, as discussed above, a submarine is least likely to be detected by an adversary, and conversely is most likely to passively detect other vessels, at speeds between to 1 knots. Second, one of the keys to collision avoidance with ~~a~~ marine mammals, particularly a whale, ~~marine mammal,~~ vessel, or the ocean bottom is detection. Detection of another vessel is the goal of anti-submarine warfare. During anti-submarine warfare training there is a heightened awareness of the need to detect and identify everything within the water column since it may be the opponent. The Navy has conducted submarine operations in and around the Hawaiian Islands for years, and is unaware of any collisions on the PMRF range between a Navy submarine and a marine mammal during range operations.

A less serious potential involves disturbing or changing the behavior pattern of a marine mammals in a way that would harm it. As addressed above, the lack of collisions between Navy submarines and marine mammals may be due in part to the their ability to detect and avoid submarines a reaction that does not harm the marine mammal. Because Navy submarines do not try to approach or follow marine mammals and few submarines (approximately to 12) are at sea, there is little likelihood of any encounter with a marine mammal that would alter its behavior.

Active sonar is used rarely, if ever, ~~used~~ by submarines in anti-submarine warfare training since it discloses the presence of the sending unit. The area where sound levels exceed other naturally-occurring sounds is relatively small, the duration is limited and the speed of the advancing submarine allows for avoidance by a marine mammal.

Thus, because of their operating characteristics, passive detection capabilities, submarine anti-submarine warfare training is unlikely to have any effect on marine mammals. Even if there is a chance encounter with a marine mammal and it changes its behavior temporarily, such an effect would be transitory. There are no indirect or cumulative effects.

4.4.1.2.8.2 Torpedo Exercises Using Retrievable Non-explosive Torpedoes

Torpedo exercises are an integral part of the training in anti-submarine warfare training. Controls serve to ensure accurate measurement of effectiveness and to ensure no individual, equipment, or marine life is harmed.

The typical training scenario consists of two submarines operating within an assigned area within the range. Those exercises conducted on the HATS are conducted in shallow depths with speeds of about 3 knots, with occasional speeds of knots. On the BARSTUR and BSURE range s at PMRF, vessel speeds are a little greater but generally are still below 1 knots occasionally tactical maneuvering does require speeds in excess of 3 knots in the deeper areas. Low vessel speeds, as discussed above, aid in navigation and passive detection of the other submarine. Low speed diminishes the likelihood of interactions with marine mammals. At infrequent intervals, submarines may use very short transmissions of active sonar to defect opposing submarines. The vast ma ority of the time the submarines passively monitor the water column.

When the torpedo reaches the end of its run, the submarine mechanically cuts the guidance wire at the torpedo tube the torpedo stops its forward movement, it reduces speed and turns upward toward the surface. This change in direction typically breaks the guidewire which falls to the ocean bottom where it deteriorates in the marine environment. After the torpedo firing, the utility boat or helicopter standing by on the range will retrieve the torpedo for reuse.

The potential for any harm to marine mammals from exercise torpedoes used during a submarine torpedo exercises is very remote. Exercise torpedoes are fired under very controlled circumstances that involve procedures to ensurethat marine mammals, particularly whales are not present. These involve, at a minimum, a detailed visual search of the range from recovery vessels and range controllers supplemented by passive sonar information from the submarines and hydrophones. The range clearance procedures are frequently supplemented by air reconnaissance flown by helicopters when available to further ensure the range is determined clear and an exercise is immediately halted if the range is fouled by a marine mammal or a vessel. All observers are in continuous communications and have the capability to immediately stop the operations.

Most torpedo firings occur at PMRF outside the 183-m (1 -fathom) isobath. PMRF strictly controls weapons firings and does not permit an exercise to proceed until the range is determined clear after consideration of inputs from ships sensors, visual surveillance of the range from aircraft and range safety boats, radar data, acoustic information from a comprehensive system of sensors and surveillance from shore. The exercise can be modified as necessary to obtain a clear range, or it is canceled. (U.S. Department of the Navy, 1 , 21 Apr, p.3) 1

Exercise torpedoes carry only inert warheads and will not explode. Even though they are inert, exercise torpedoes are set to miss the target to avoid mechanical impacts. On rare occasions, less than one per year, torpedoes with explosive warheads (warshots) are fired for test and evaluation. Such test and evaluation exercises, are even more carefully controlled in order to ensure safety and obtain valid data. Given their tight control and the infrequent conduct of shots involving warshots, the risk to marine mammals is extraordinarily remote. The potential for any harm is localized, transitory and does not include any indirect or cumulative effects.

4.4.1.2.8.3 Mine Warfare Training during Submarine Transit of a Field of Bottom-Moored Practice Mines

Submarine commanding officers routinely conduct mine avoidance as part of the type training for their crews. The fixed underwater minefield off Port Allen has mine shapes floating on cables fixed to the bottom in waters well in excess of 183 m (1 fathoms). The mine shapes float from the bottom at depths between 182. to 213. m (to ft) below the surface of the ocean. The mine shapes (drill mines) are inert.

A submarine approaches the known location of the range and activatesan active sonar for mine detection and avoidance. The submarine s speed of advance is very slow (less than five knots) to allow for navigational ad ustment in the event of mine detection. When the traverse is complete, the sonar is secured and normal passive sonar detection is resumed.

These operations pose no threat of harm to marine mammals direct, indirect or cumulative for a number of reasons. First, the drill mines are moored at a depth of 182. to 213. m (to ft) below the surface, which is deeper than marine mammals generally swim. The drill mine cables are under considerable tension and because the anchors are on the ocean floor, a marine mammal would have to swim even deeper to encounter them. Thus the risk of entanglement is extraordinarily remote. Secondly, the sonar emissions used to locate and avoid the drill mines pose no risk to marine mammals. The sonar that submarines use to navigate such minefields is a low power, high frequency sonar that is swept back and forth in front of the submarine. Because of the low power, even a high frequency, the sonar pulses are quickly attenuated.

4.4.1.2.8.4 Range Exercise

The impacts of range exercises, a multi-submarine exercise to develop and test tactics without the firing of torpedoes, would be essentially the same as those identified above for submarine warfare exercises.

4.4.1.2.8.5 Torpedo Training and Certification Program

The impacts of the torpedo training and certification program, where submarines are certified in launching torpedoes and for training submarine crews in various tactics while firing torpedoes, would be essentially the same as those identified above for torpedo exercises using retrievable non-explosive torpedoes.

4.4.1.2.8.6 Submarine Target Tracking System Exercises

The impacts of the submarine target tracking system exercises, where the performance of modified submarine targets is evaluated, would be essentially the same as those identified above for submarine warfare exercises and for torpedo exercises using retrievable non-explosive torpedoes.

4.4.1.2.8.7 Submarine Transit Operations (Surfaced and Submerged) to and from Ports and Operating Areas

On any given day, four or five submarines are at sea either transiting to/from or underway in an operating area. During ma or exercises such as RIMPAC the at sea rate of the submarines may increase to 8 to 1 submarines at sea on any given day. Total submarine days at sea averages between 1, and 2, days per year in the local operating areas.

The risk of harm to marine mammals during submarine transits is very small. The greatest potential risk is that of collision. In the many years of Navy operations in Hawaiian waters, the Navy is unaware of any collision <u>on the PMRF range</u> between a Navy submarine and a marine mammal~~s~~, especially a humpback whale. Depending on the angle of incidence, speed and depth, a collision with a submarine could in ure or kill a marine mammal~~s~~. The potential for such a collision with a Navy ship transiting between operations areas, however, is extremely remote for a number of reasons. First, submarines conduct most operations submerged at moderate speeds (1 to 1 knots) to ensure that their passive sonar remains usable. Given the ability of marine mammals to attain speeds of twenty knots, they are able to avoid collision. Second, submarines are able to detect marine mammals with their passive sonar when they are present. Third, when submerged, submarines are highly maneuverable and during most evolutions are able to maneuver radically, if necessary, to avoid collision. Finally, when the submarine is surfaced, the watch section is larger than that of many commercial vessels. The Navy has specific training standards for both lookouts and bridge watch-standers that trains personnel in the use of binoculars and specific techniques to maximize their ability to sight marine mammals so that evasive action can be taken. Typically, a submarine will have three lookouts, the officer of the deck, the unior officer of the deck, and a watch-stander manning the periscope from inside the submarine all conducting visual searches.

Another potential effect involves disturbing or changing the behavior pattern of a marine mammal in a way that would harm them. The lack of collisions between Navy vessels and marine mammals may be due in part to their ability to detect and avoid our vessels - a reaction that does not harm the marine mammal. Because Navy vessels are not trying to approach or follow marine mammals, these essentially random interactions are brief and unlikely to harm them because of the small areas affected, the relatively short time frames involved and the relatively few submarines at sea in the Hawaiian area at any one time even during ma or exercises.

4.4.1.2.9 Fleet Training Exercises

The ongoing, continuing fleet training exercises conducted in the ocean area typically combine some or all of the elements of the other exercises identified, namely: missile training, air operations, gunnery, bombing, mining, electronic warfare, undersea warfare, and submarine operations exercises. As such, the impacts would be essentially identical to those identified above for these individual exercises. Potential exceptions to this would be the RIMPAC Exercise, because of its scale, and the amphibious assault landings that are part of this biennial exercise. The potential for impacts from the RIMPAC Exercise is discussed below, except for the impacts of the amphibious assault (or warfare) landings which we addressed in section .1.1.3.1. In addition, the potential for impacts from transit operations between harbors and operating areas is also discussed.

4.4.1.2.9.1 Rim-of-the-Pacific Exercise

RIMPAC is conducted every 2 years in the summer months. Recent RIMPAC exercises have involved over 2 , soldiers, sailors, coastguardsmen, airmen and marines, with over ships, submarines, and 2 aircraft typically participating. RIMPAC can last up to ~~1~~ 3 days, much of that time is spent at distances considerably remote (over 2 1 km 1 mi) from ~~to~~ the Hawaiian Islands ~~in the open ocean area~~. The amount of time spent within 2 1 km (1 mi) of the Hawaiian islands depends on the exercise scenario. Because of the recent emphasis on littoral warfare and the threat of submarines adapted to coastal operations, recent scenarios typically include amphibious operations and the anti-submarine warfare operations necessary to conduct them safely. These are addressed in section .1.1.3.1.

However, despite the large number of surface ships and submarines involved, thereis almost no additional potential effects on marine mammals apart from the very low risk of collision with a ship. In the many years of Navy operations in Hawaiian waters, the Navy is unaware of any collision between a Navy ship and a marine mammal.

The most serious potential direct effect of surface ship operations, including training in engineering, seamanship and general warfare-related tasks, is collision of a ship and a marine mammal. Depending on the angle of incidence, speed and depth, such a collision could in ure or kill a marine mammal. The potential for such a collision, however, is extremely remote for a number of reasons. First, surface ships conduct most operations at moderate speeds (1 to 1 knots) for reasons of fuel economy. Given the ability of humpback to attain speeds of twenty knots, they are able to avoid collision. Second, the watch section for a surface ship, even during routine steaming, is robust compared with many commercial vessels. The Navy has specific training standards for both lookouts and bridge watch-standers that trains personnel in the use of binoculars and specific techniques to maximize their ability to sight marine mammals so that evasive action can be taken. Typically a surface ship will have three lookouts and two officers conducting visual searches. Most Navy ships are also highly maneuverable and during most evolutions are able to maneuver, radically if necessary, to avoid collision.

A less serious potential effect involves disturbing or changing the behavior pattern of a marine mammal in a way that would harm them. As addressed above, the lack of collisions between Navy ships and marine mammals may be due in part to their ability to detect and avoid surface ships a reaction that does not harm the marine mammal. Because Navy ships are not trying to approach or follow marine mammals, these essentially random interactions are brief and unlikely to harm marine mammals because of the small areas affected, the relatively short time frames involved and the relatively few surface ships at sea in the Hawaiian area at any one time even during ma or exercises.

4.4.1.2.9.2 Low Flying Tactical Helicopter Flights

The potential that helicopter training flights between 1 to 1 2 m (2 and ft) would affect marine mammals is extraordinarily small. The only mechanism for such an effect would involve the crash of a helicopter that happened to occur at the spot where a mammal had surfaced, or the chance that the operations would disturb the behavior of a marine mammal. Helicopter flights conducted at altitudes of between 1 to 1 2m (2 and ft) are demanding and unforgiving of crew errors or equipment problems. For this reason, in the absence of tactical reasons, helicopters typically fly above 1 2 m (ft). Flights below 1 2 m (ft) are only conducted when necessary to safely perform the mission assigned. Because of the geometry, even flying at 1 m (2 ft) means that helicopters rarely would fly within 3 .8 m (1, ft) of marine mammals.

Aircrews are always visually scanning the environment when operating at low altitudes for safety of flight reasons. At night, helicopter crews often supplement their vision with night vision goggles allowing them to see in the dark. Helicopters are not trying to approach or follow marine mammals during their missions and because the aircrews are aware of the minimum approach distances for marine mammals, they can avoid overflying marine mammals if they are detected. An overflight would occur only if a marine mammal were undetected until the last moment so that the aircrew could not safely react in time. Any overflight would be a momentary, random interaction unlikely to harm them because of the small areas affected, the relatively short time frames involved and the lack of any effort on the part of the aircrew to repeat the event. Thus even if these very unusual circumstances did occur, such an effect would be a localized, transitory phenomena and would have no cumulative impacts.

Chief of Naval Operations Instructions and Operational Orders from the Third Fleet Commander reiterate the requirements of the Marine Mammal Protection Act and require naval personnel not to harm, harass or threaten any marine mammal.

4.4.1.2.9.3 Landings, Takeoffs and Training Flights at Altitudes above 15.2 Meters (50 Feet) by Helicopters from Ships

The potential that helicopter landings and takeoffs from ships would affect marine mammals is extraordinarily small. The only mechanism for such an effect would involve the crash of a helicopter upon approach or departure from the ship that happened to occur at the spot where a marine mammal had surfaced, or the chance that the operations would disturb the behavior of a marine mammal. This of course, assumes that a marine mammal has positioned itself very close to a ship that happens to be launching helicopters a very unlikely event in itself. Even if these very unusual circumstances did occur, such an effect would bea localized, transitory phenomena and would have no cumulative impacts. Aircraft in the immediate vicinity of ships are involved in either takeoffs or landings at altitudes no lower than 1 .2 m (ft) (flight deck height) for aircraft carriers and ma or amphibious ships, which undertake the most intensive flight schedules. Flight decks on cruisers, destroyers and frigates are lower, but these ships usually carry only one, or at most two, helicopters. They do not engage in high volume helicopter operations. Although amphibious ships may engage in helicopter operations at anchor, most launches and takeoffs are conducted when the ship is underway. During such operations, a ship has to maintain a uniform relative wind across the deck for safety reasons and is unlikely to begin such operations if there are indications that marine mammals (or anything else that might require undue maneuvers) are in the vicinity.

Even if a marine mammal did approach the ship, aircrews are always visually scanning the environment when operating at low altitudes for safety of flight reasons. Aircraft are not trying to approach or follow marine mammals during their missions and because the aircrews are aware of the minimum approach distances for marine mammals, they can avoid overflying marine mammals and whales in most instances. Only if a marine mammal were undetected until the last moment so that the aircrew could not safely react in time would an overflight occur. Any overflight would be a momentary, random interaction unlikely to harm them because of the small areas affected, the relatively short time frames involved and lack of any effort on the part of the aircrew to repeat the event.

Chief of Naval Operations Instructions and Operational Orders from the Third Fleet commander reiterate the requirements of the Marine Mammal Protection Act and require naval personnel not to harm, harass or threaten any marine mammal.

4.4.1.2.9.4 Transit Operations Between Harbors and Operating Areas

Transit operations between harbors and operating areas pose a very low risk of potentially harmful effects on marine mammals, direct, indirect or cumulative. Despite having conducted countless ship transits from harbor to operations areas for many years, there have been no indications that such operations have had any effect on marine mammals in Hawaiian waters.

There have been no ~~collisions or~~ observable long-term effects on marine mammals on the PMRF range. There is, however, a remote possibility of collision with a marine mammal. Special sea and anchor details (watches) are posted to ensure adequate lookouts are in position and the most experienced crews are maneuvering the ships until the ship reaches either the operating area or the open ocean. Before qualifying as lookouts, individuals must receive special training regarding visual positioning reports and required reports to the maneuvering bridge to avoid collisions and other hazards to either the vessel or marine mammals.

Commanding officers have been directed to ensure their operations do not harm marine mammals. Chief of Naval Operations Instructions, Operational Orders from the Third Fleet Commander and a handbook from Commander Naval Surface Group Middle Pacific (Hawaii area) reiterate the requirements of the Marine Mammal Protection Act not to harm, harass or threaten any marine mammal. The handbook goes further and provides guidance that reiterates the prohibitions in CFR 222.31.

4.4.1.2.10 Testing and Evaluation Exercises

That portion of ongoing RDT E exercises that takes place in the open ocean area, typically involving torpedo, torpedo defense, submarine and periscope detection, submarine systems, anti-submarine warfare, ship-defense systems, and other miscellaneous programs identified in section 2.2.1. , would have essentially the same impacts as those identified above for the ongoing fleet training exercises.

~~In terms of the potential for cumulative impacts, T~~the combined ongoing~~, continuing~~ Fleet Training Exercises conducted at PMRF would have no discernible or measurable cumulative effect on the ocean s overall physical and chemical properties, i.e., its salinity, density, temperature, acidity (pH), or mix of dissolved gases, and thus would have no cumulative impacts to the overall marine biology of the Ocean Area region of influence. Moreover, the exercises would have no discernible cumulative effect on the biological diversity of either the pelagic or benthic marine environments.

While the exercises would have no discernible or measurable cumulative impact on phytoplankton or zooplankton in the pelagic zone, the potential exists for cumulative impacts to nekton organisms, since most species of nektonic animals live near the sea surface. Of particular concern is the potential for incremental, additive cumulative impacts to marine mammals, particularly marine mammals. However, despite having conducted operations in Hawaiian waters for many years, there have been no indications that such operations have had any effect on marine mammals or other marine mammals, cumulatively, or by individual exercise or operation.

Over and beyond the current operating procedures, no mitigation measures for biological resources are proposed.

4.4.1.3 Health and Safety— Ocean Area (Outside U.S. Territory)

All PMRF-controlled fleet training activities that occur over the open water would continue to be conducted in Warning Areas W-18 and W-188. Range Safety officials at PMRF ensure the operational safety of pro ectiles, targets, missiles, air operations, and other hazardous fleet training activity into PMRF-controlled areas. The range safety procedures at PMRF avoid risks to the public and operations personnel by providing some of the most rigorous safety procedures because of the extra sensors available. Before any operation is allowed to proceed, the overwater range is determined cleared using inputs from ship sensors, visual surveillance of the range from aircraft and range safety boats, radar data, and acoustic information from a comprehensive system of sensors and surveillance from shore. In addition, prior to conducting any training on PMRF, the operation must obtain PMRF safety approval before proceeding, covering the type of weapon, type of target, speed, altitude, debris corridor, and surface water hazard area.

Once the area is determined cleared, operations are conducted within the boundaries of the safety areas. In addition, the Warning Areas are continually monitored during range operations to ensure that no unauthorized ships or aircraft enter the area. These safety procedures minimize potential risks to the public from fleet training exercises. As the range is determined clear prior to any operations being conducted, the only public health and safety issue is if a hazardous operation exceeds the safety area boundaries. This risk is reduced by providing termination systems on some of the missiles or by determining that the area based on the distance the system can travel for those missiles without flight termination (typical air-to-air missile) is clear. In the cases where a system does not have a flight termination, the range is determined clear based on the flight distance the vehicle can travel, plus an 8-km (-mi) area beyond the system performance parameters.

The ongoing, continuing Fleet Training Exercises conducted at PMRF would have no impact on public health and safety in the open ocean environment. The Navy takes every reasonable precaution during the planning and execution of the operations, training exercises, and test and development activities to prevent in ury to human life or property. Specific safety plans are developed to ensure that each hazardous operation is in compliance with applicable regulations and ensure the general public, range personnel, and range assets are provided an acceptable level of safety. As part of the safety analysis, range users are required to provide specific information about their program(s) so that an appropriate safety analysis can be completed prior to initiation of activities. This includes preparation of the Range Safety Approval and Range Safety Operational Plans required of all programs at PMRF.

Range Safety officials ensure operational safety for pro ectiles, targets, missiles, and other hazardous operations into PMRF operational areas. The operational areas consist of two Warning Areas (W-18 and W-188) under the local control of PMRF. The Warning Areas are in international waters and are not restricted however, the surface area of the Warning Areas is listed as HOT (actively in use) 2 hours a day. For special operations, multi-participant or hazardous weekend firings, PMRF publishes dedicated warning NOTMARs and NOTAMs.

In addition, all activities must be in compliance with DOD Directive .1 (as enclosed by OPNAVINST 3 . A) which specifies procedures for conducting aircraft operations and for missile/pro ectile firing, namely the missile/pro ectile firing areas shall be selected so that tra ectories are clear of established oceanic air routes or areas of known surface or air activity.

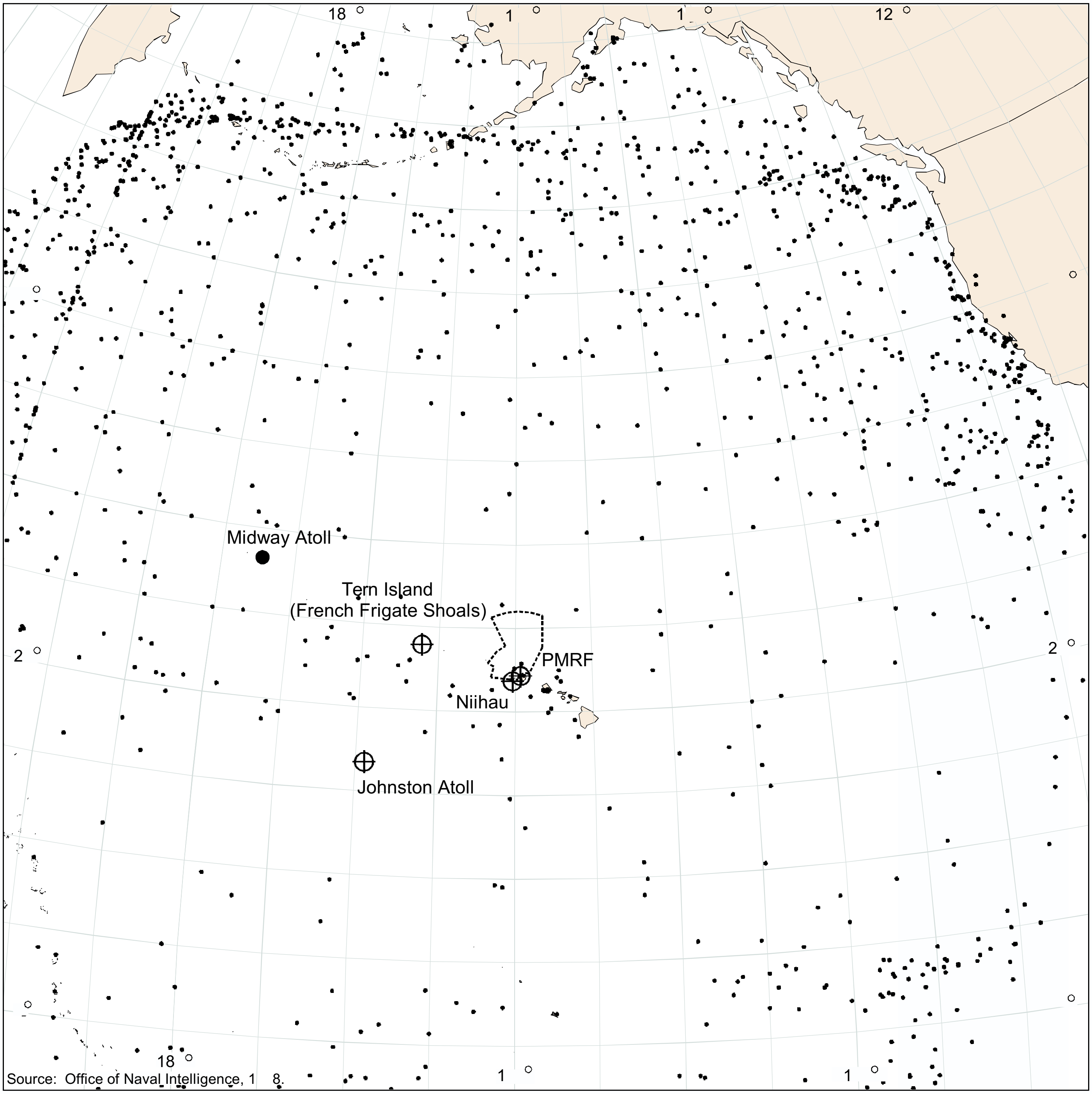
In terms of the potential for cumulative impacts, the required range safety approval and range safety operational plans would obviate the potential for additive, incremental, cumulative impacts.

The required range safety approval and range safety operational plans would obviate the need for additional mitigation measures.

4.4.1.4 Transportation— Ocean Area (Outside U.S. Territory)

The ongoing, continuing Fleet Training Exercises would continue to be carried out in northern Pacific waters that could, potentially, be intersected by commercial shipping. Procedures are in place, however, that minimize disruption to commercial shipping by the Exercises. First, Fleet Training Exercises are not carried out in waters that coincide with the busiest shipping routes. Second, the prior notification of Fleet Training Exercises to commercial shipping enables the vessels to plot alternative routes away from the exercise areas. Figure . .1. -1 illustrate the relationship between the exercise area and shipping movements.

All PMRF-controlled fleet training activities that occur over the open water would continue to be conducted in Warning Areas W-18 and W-188. Range Safety officials at PMRF ensure the operational safety of pro ectiles, targets, missiles, air operations, and other hazardous fleet training activity into PMRF-controlled areas. The range safety procedures at PMRF avoid risks to the public and operations personnel by providing some of the most



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EXPLANATION

- Ship
- Existing Warning Area
- Midway (Geographical reference only)
- Candidate Sites

NORTH

Scale

33 8 Kilometers

23 8 Nautical Miles

Pacific Missile Range Facility Composite Snapshot of Ship Locations in the Northern Pacific (Revised)

Open Ocean

Figure 4.4.1.4-1

ocean tp 1

rigorous safety procedures because of the extra sensors available. Before any operation is allowed to proceed, the overwater range is determined cleared using inputs from ship sensors, visual surveillance of the range from aircraft and range safety boats, radar data, and acoustic information from a comprehensive system of sensors and surveillance from shore. In addition, prior to conducting any training on PMRF, the operation must obtain PMRF safety approval before proceeding, covering the type of weapon, type of target, speed, altitude, debris corridor, and surface water hazard area.

Once the area is determined cleared of ships, operation are conducted within the boundaries of the safety areas. In addition, the Warning Areas are continually monitored during range operations to ensure that no unauthorized ships enter the area. These safety procedures minimize potential risks to commercial and private shipping from fleet training exercises. As the range is determined clear prior to any operations being conducted, the only shipping issue is if a hazardous operation exceeds the safety area boundaries. The risk is reduced by providing termination systems on some of the missiles or by determining that the area based on the distance the system can travel for those missiles without flight termination (typical air-to-air missiles) is clear of surface vessels. In the cases where a system does not have a flight termination, the range is determined clear based on the flight distance the vehicle can travel plus an 8-km (-mi) area beyond the system performance parameters.

In terms of the potential for cumulative impacts, no other programs or activities that would have an impact on transportation have been identified.

No mitigation measures for transportation are proposed.

4.4.1.5 Water Resources— Ocean Area (Outside of U.S. Territory)

Discernible and measurable potential impacts to water quality in the ocean area from ongoing, continuing activities would come primarily from the missile training exercises, with both the entry of expended missiles and target drones into the water, and from expended booster rocket motors from the various rocket launch programs at KTF.

The normal operation of both surface ships and submarines would not impact water quality in the ocean area because all underway surface and subsurface Navy vessels would comply with OPNAVINST .1B and thus avoid underway discharges to the open ocean.

4.4.1.5.1 Water Quality Impacts from Target Drones and Missile Exercises

NASA conducted a thorough evaluation of the effects of missile systems which are deposited in seawater. It concluded that the release of hazardous materials aboard missiles into seawater would not be significant. Materials would be rapidly diluted and, except for the immediate vicinity of the debris, would not be found at concentrations identified as producing any adverse effects. The Pacific Ocean depth in the vicinity of the launch area is hundreds of meters (feet) deep, and consequently the water quality impact from the fuel is expected to be minimal. Any area affected by the slow dissolution of the propellant would be relatively small due to the size of the target drone motor and/or missile propellant pieces relative to the quantity of seawater (U.S. Department of the Navy, 1 , 1 Jul, p. -). 1 8

4.4.1.5.2 Water Quality Impacts from Rocket Launch Programs

Water quality impacts from rocket launch programs would be essentially the same as those identified above from target drones and missile exercises. While the quantities of hazardous materials released into sea water may be greater, given the larger size of rocket booster motors, the material would also be rapidly diluted and, except in the immediate vicinity of the debris, would also not be found in concentrations identified as producing any adverse effects.

Some unavoidable cumulative impacts to water quality may occur from the ongoing, continuing activities. The area potentially affected from each activity would be very small, and any water contamination would be rapidly diluted and dispersed.

No mitigation measures for water resources are proposed.

4.4.2 PROPOSED ACTION— OCEAN AREA (OUTSIDE U.S. TERRITORY)

4.4.2.1 Airspace Use— Ocean Area (Outside U.S. Territory)

The pre-flight site modification/construction activities, the land-based operations andtraining, and base operations and maintenance activities would have no impact on airspace use in the open ocean environment. Only the proposed test flight operations and training activities have the potential for impacts to airspace use in the ocean environment. These are discussed below.

Typically Target missile and defensive missile tra ectories would be at very high altitudes passing through FL in ust a matter of minutes after launch, and thus well above the airspace sub ect to the rules and regulations of Article 12 and Annex 11 of the ICAO Convention. However, the designation and activation of booster drop areas in the launch corridor and intercept debris impact areas could have airspace use impacts, that would be essentially the same for each of the flight tests and missile intercept scenarios and target missile launch options. In addition, the launching of mobile platform sea-based targets from the MATSS or LTS and aerial platform-based targets within the Ocean Launch Area within the Temporary Operations Area could have airspace use impacts that would be essentially the same. These are identified below:

4.4.2.1.1 Controlled and Uncontrolled Airspace

The airspace in the region of influence outsideterritorial limits~~the 22.2-km (12-nmi) limit~~ lies in international airspace and, consequently, is not part of the NAS. Because the area is in international airspace, the procedures of ICAO, outlined in ICAO Document , Rules of the Air and Air Traffic Services, are followed. ICAO Document is the equivalent air traffic control manual to FAA Handbook 11 . , *Air Traffic Control*. The FAA acts as the United States agent for aeronautical information to the ICAO, and air traffic in the over-water region of influence is managed by the Honolulu and OaklandARTCCs.

After launch, typically the target missiles would be above FL within minutes of the rocket motor firing. As such, all other local flight activities would occur at sufficient distance and altitude that the target missile and interceptor missiles would be little noticed. However, activation of the proposed stationary ALTRV procedures, where the FAA provides separation between non-participating aircraft and the missile flight test activities in the Temporary Operations Area for utilization of the airspace identified in figure 2.3- would impact the controlled airspace available for use by non-participating aircraft for the duration of the ALTRV - usually for a matter of a few hours, with a back-up day reserved for the same hours. Because the airspace in the Temporary Operating Area is not heavily used by commercial aircraft, and is far removed from the en route airways and et routes crossing the North Pacific, the impacts to controlled/uncontrolled airspace would be minimal.

The proposed 3. -km (2-nmi) radius Restricted Area, extending from the surface up to as high as ,182 m (1 , ft) mean sea level over the MATSS , would marginally reduce the amount of navigable airspace in the Ocean Area region of influence, but because the airspace is not heavily used by commercial aircraft, and is far removed from the en route airways and et routes crossing the North Pacific, the impacts to controlled and uncontrolled airspace would be minimal.

4.4.2.1.2 Special Use Airspace

Missile intercepts would be conducted within either the existing Special Use Airspace in Warning Area W-188 and W-18 controlled by PMRF or within the Temporary Operations Area shown in figure 2.3- . Similarly, intercept impact debris would be contained within these same areas. Although the nature and intensity of utilization varies over time and by individual Special Use Airspace area, the Proposed Action would not represent a direct Special Use Airspace impact. Warning Areas consist of airspace over international waters in which hazardous activity may be conducted. This designation corresponds to the Danger Area designation of ICAO. Similarly, the use of ALTRV procedures as authorized by the Central Altitude Reservation Function, an air traffic service facility, or appropriate ARTCC (in this case the Oakland ARTCC) for airspace utilization under prescribed conditions in the Temporary Operations Area would not impact Special Use Airspace. According to the FAA Handbook, 1 . , ALTRVs may encompass certain rocket and missile activities and other special operations as may be authorized by FAA approval procedures.

PMRF would coordinate with the Oakland ARTCC military operations specialist assigned to handle such matters, and the airspace coordinator at the Honolulu Center Radar Approach using ALTRV request procedures. After receiving the proper information on each test flight, a hazard pattern would be constructed and superimposed on a chart depicting the area of operations. Ensuring that the hazard pattern would not encroach any land mass, this area is then plotted using minimum points (latitude-longitude) to form a rectangular area. This plotted area is then faxed to the military operations specialist at Oakland ARTCC requesting airspace with the following information: area point (latitude-longitude) date and time for primary and backup (month, day, year, zulu time) and, altitude. A copy would be sent to the Honolulu Center Radar Approach. A follow-up phone call would be made after 8 hours to verify receipt of the fax. When approval of the request of the airspace is received from the military operations specialist at Oakland ARTCC, PMRF would submit an ALTRV request to Central Altitude Reservation Function who publishes the ALTRV 2 hours prior to the flight test.

4.4.2.1.3 En Route Airways and Jet Routes

The numerous airways and et routes that crisscross the Ocean Area airspace use region of influence have the potential to be affected by the Proposed Action. However, target and defensive missile launches and missile intercepts would be conducted in compliance with DOD Directive .1, as enclosed by OPNAVINST 3 . A (U.S. Department of the Navy, 1 , p. -). DOD Directive .1 specifies procedures for conducting missile and pro ectile firing, namely firing areas shall be selected so that tra ectories are clear of established oceanic air routes or areas of known surface or air activity (DOD Directive .1, § E , 1 81). 22

Before conducting a missile launch and/or intercept testNOTAMs would be sent in accordance with the conditions of the directive specified in OPNAVINST 3 21.2 . In addition, to satisfy airspace safety requirements, the responsible commander would obtain approval from the Administrator, FAA, through the appropriate U.S. Navy airspace representative. Provision is made for surveillance of the affected airspace either by radar or patrol aircraft. In addition, safety regulations dictate that hazardous operations would be suspended when it is known that any non-participating aircraft have entered any part of the danger zone until the non-participating entrant has left the area or a thorough check of the suspected area has been performed.

In addition to the reasons cited above, no adverse impacts to the region of influence s over-water airways and et routes are identified because of the required coordination with the FAA. There is a scheduling agency identified for each piece of Special Use Airspace that would be utilized. The procedures for scheduling each piece of airspace are performed in accordance with letters of agreements with the controlling FAA facility, and the Honolulu and Oakland ARTCCs. Schedules are provided to the FAA facility as agreed between the agencies involved. Aircraft transiting the Open Ocean region of influence on one of the low-altitude airways and/or high-altitude et routes that would be affected by flight test activities, would be notified of any necessary rerouting before departing their originating airport and would therefore be able to take on additional fuel before takeoff. Real-time airspace management involves the release of airspace to the FAA when the airspace is not in use or when extraordinary events occur that require drastic action, such as weather requiring additional airspace.

The FAA ARTCCs are responsible for air traffic flow control or management to transition air traffic. The ARTCCs provide separation services to aircraft operating on IFR flight plans and principally during the en route phases of the flight. They also provide traffic and weather advisories to airborne aircraft. By appropriately containing hazardous military activities within the over-water Warning Areas or by using ALTRV procedures in the Temporary Operations Area, non-participating traffic is advised or separated accordingly, thus avoiding substantial adverse impacts to the low altitude airways and high altitude et routes in the region of influence.

The proposed 3. -km (2-nmi) radius Restricted Area, extending from the surface to 1 m (3, ft) mean sea level over the MATSS, while it would marginally reduce the amount of navigable airspace in the Ocean Area region of influence, would not have an impact on the en route airways and et routes in the Open Ocean region of influence. It would be far removed from the en route airways and et routes crossing the North Pacific, the closest being the A high altitude et route that runs east-west above , 8 m (18, ft) mean sea level approximately 3 .8 km (1 nmi) south of Tern Island (see figure 3. .1-2).

4.4.2.1.4 Airports and Airfields

There are no airports or airfields in the Ocean Area airspace use region of influence. Consequently, there would be no impacts to airports and airfields.

In terms of the potential for cumulative impacts, all Proposed Action intercept activities would take place either in existing special use airspace that has been in existence since the early 1 s, and is cleared of~~n~~ non-participating aircraft, or within the proposed new ALTRV airspace. The required scheduling process for the use of this airspace would obviate the potential for adverse cumulative impacts.

In terms of mitigation measures, the well defined special use airspace dimensions and scheduled time of use on aeronautical charts, in addition to the positive air traffic control obviate the need for mitigation measures. However, the indirect impacts of airspace use utilization could be mitigated by the implementation of procedures to decrease the disturbance from flight operations, and ~~that~~ stress the importance of effective community relations and the need to keep the public informed. An annual evaluation of flight activities, including missile launch activities to ensure that every effort is made to reduce any adverse indirect impacts, including a review of mission changes in regard to supersonic operations, could ensure that impacts are ameliorated.

4.4.2.2 Biological Resources— Ocean Area (Outside U.S. Territory)

The pre-flight site modification/construction activities, the land-based operations and training, and base operations and maintenance activities would have no impact on the open ocean environment. Only the proposed TBMD test flight operations and training activities have the potential for impacts in the ocean environment. These are discussed below.

The proposed TBMD test flight operations would have no discernible or measurable effect on the ocean s overall physical and chemical properties (i.e., its salinity, density, temperature, acidity (pH), or mix of dissolved gases), and thus would have no impacts to the overall marine biology of the Ocean Area region of influence. Moreover, the proposed test flight operations and training activities would have no discernible effect on the biological diversity of either the pelagic or benthic marine environments. The vast ma ority of proposed activities would take place far removed from land, in the open ocean, or pelagic zone, which contains approximately 2 percent of marine species (Hickman, Roberts, and Hickman, 1 , p.12). 3

While the Proposed Action would have no discernible or measurable impact onphytoplankton or zooplankton in the pelagic zone, the potential exists for impacts to nekton organisms, since most species of nektonic animals live near the sea surface. Of particular concern is the potential for impacts to marine mammals, ~~particularly marine mammals and the potential for impacts~~ from both acoustic and non-acoustic effects. Potential acoustic effects include behavioral disturbance (including displacement), acoustic masking (elevated noise levels that drown out other noise sources), and (with very strong sounds) temporary or permanent hearing impairment. Potential non-acoustic effects include physical impact by falling debris, entanglement in debris, and contact with or ingestion of debris or hazardous materials. In ury by the shock wave resulting from impact of a large, fast-moving ob ect (such as a missile booster or target or interceptor vehicle) with the water surface could be considered either a acoustic or non-acoustic effect. ~~emissions from various products and activities.~~ In particular, the Navy acknowledges that acoustic emissions from various products and activities could be interacting with marine mammals hearing. Federal regulations promulgated under the MMPA have recognized that some criterion of measurement is necessary. Furthermore, the NMFS considers TTS, a reversible decrease in hearing sensitivitiesthat results from exposure to loud sound, as a potential measure for evaluating impacts of sound emissions.

Temporary threshold shift (TTS) is used as a measure of temporary reduction in hearing sensitivity. For sound levels at or somewhat above the TTS threshold, hearing sensitivity recovers rapidly after exposure to the noise ends. Much greater single noise exposures would be required to result in permanent hearing damage, while lesser noise levels would involve only minor behavioral responses with no effect on hearing sensitivity. The NMFS considers TTS to be a potential measure for evaluating impacts of sound emissions.

The potential for impacts exists from the: first- and second-stage target missile booster s and defensive missile booster s fall to the ocean surface from intercept debris in the case of a successful intercept and, from both the target vehicle s and defensive missile payload s fall to the ocean surface in the case of an unsuccessful intercept (see figures 2.3.1-- in section 2.3.1.3.). Potential adverse effects could occur from: sonic boom overpressures shock wave impact or direct contact ingestion of toxic solutions generated from the unburned propellant mixed with seawater ingestion of pieces of unburned propellant and, entanglement with the submerged parachutes in the case of the Air Drop target missile launch option.

In a successful intercept, both missiles would be destroyed by the impact. Momentum would carry debris along the respective paths of the two missiles until the debris falls to earth. The debris would consist of a few large pieces, kg (~~1~~ 11 lb), of each missile, many medium pieces, kg (~~1~~ 11 lb), and mostly tiny particles. This debris is sub ect to winds on its descent to the surface. The debris would generally fall into twoelliptically-shaped areas. Most debris would fall to earth within 3 to minutes after intercept, but some of the lighter particles may drift, airborne, for as long as 2 to hours before landing.

Large pieces of falling debris from missiles or targets may strike and in ure or kill marine mammals. As a general guideline, pieces of debris with an impact kinetic energy of 1 oules (11 foot-pounds) or higher are hazardous to humans (Cole andWolfe, 1 18

Appendix G in U.S. Air Force 1 b). Large marine mammals could sustain impacts from debris with higher kinetic energy than this without being in ured. 18

4.4.2.2.1 Sonic Boom Overpressure Impacts

In the event of a missed intercept, the target missile would continue, intact, on its tra ectory. The target missile could generate a sonic boom as described in section .2.1. .2. For the reentry of a Hera missile ranging from . to kg (2 to 2 lb) psf, the psf contour would extend . km (. mi) on each side of the target impact point. The sonic boom overpressures translate into the water column with corresponding underwater noise levels of 1 dB to 1 dB. These noise levels are of very short duration.

Each missile would propagate a unique sonic boom contour depending upon its mass, shape, velocity, and reentry angle, among other variables. The location of the possible impact point would vary depending upon the particular flight test profile. It is therefore, difficult to produce the specific location, extent, duration, or intensity of sonic boom impacts upon marine life.

The noise level thresholds of impact to marine life in general, and marine mammals in particular, are currently the sub ect of scientific analysis. There is the possibility that underwater noise levels resulting from missile reentry sonic booms could affect some marine mammals or sea turtles in the open ocean. In addition, since different species of marine mammals have varying sensitivity to different sound frequencies and may be found at different locations and depths in the ocean, it would be difficult to generalize concerning sound impacts to marine mammals from missile impacts in the broad ocean area. Should consensus emerge from the scientific analysis about the effects of underwater noise upon marine mammals, it would then be possible to predict the consequences of a particular sonic boom contour upon marine mammals in the vicinity.

4.4.2.2.2 Shock Wave Impact or Direct Contact

The first- and second-stage target missile boosters and defensive missile boosters fall to the ocean surface, and the target vehicle s and defensive missile payload s fall to the ocean surface, in the case of an unsuccessful intercept, would impart a considerable amount of kinetic energy to the ocean water upon impact. Missiles and targets will hit the water with speeds of 3 to 3, feet per second. It is assumed that the shock wave from their impact with the water is similar to that produced by explosives. At close ranges, in uries to internal organs and tissues would likely result. ~~The amount of energy would be a fraction of the chemical energy of the fuel burned. The intensity and duration of the shock wave is not known, but could conceivably affect marine mammals.~~ However, the taking of, or in ury to, any marine mammal by direct impact or shock wave impact would be extremely remote (less than . marine mammals exposed per year). The splashdown of the first- and second-stage target missile boosters and defensive missile boosters, and the target vehicle s and defensive missile s payloads, in the case of an unsuccessful intercept, is planned to occur in open ocean waters thousands of feet deep at considerable distance from the nearest land.

Analysis in the *Marine Mammal Technical Report* (NAWCWPNS Point Mugu, 1 8, Dec) prepared in support of the Point Mugu Sea Range Environmental Impact Statement, determined that there is a very low probability that a marine mammal would be killed by falling missile boosters, targets, or debris as a result of tests at the Point Mugu Sea Range (less than . 1 marine mammals exposed per year). This probability calculation was based on the size of the area studied and the density of the marine mammal population in that area. The analysis concluded that the effect of this missile debris and intact missiles coming down in the open ocean would be neglible. The range area at Point Mugu is smaller (3,2 km^2 2 ,183 nmi^2) than the PMRF range area (1 , km^2 2, nmi^2) and the density of marine mammals at Point Mugu is larger than the density found at PMRF. Table 3.2.2.3-2 indicates the information that is known about marine mammal density in the PMRF range area. It is reasonable to conclude that the probability of a marine mammal being in ured or killed by missile or debris impact from Navy testing at PMRF is even more remote than at Point Mugu, since the area at PMRF is larger and the density of marine mammals is smaller. Following formal consultation, the NMFS concluded that the proposed action is not likely to adversely affect any marine mammal species.

Standard range warning and checking procedures would check for visible large concentrations of marine mammals in the area of the target launch (for the sea launch and SR-ALT launch options), tra ectory, and landing. Patrol and surveillance aircraft would be dispatched prior to launch and would patrol an area of potential hazard. The aircraft would also use surface radar to search the water surface. If contacts are made and confirmed, based upon location, heading, and speed of the contact, the Flight Safety officer would determine whether to continue on schedule, delay the test flight, or postpone it until another day.

4.4.2.2.3 Ingestion of Toxic Solutions Generated from the Unburned Propellant Mixed with Seawater

The concentration and toxicity of dissolved solid rocket motor fuel in the ocean, in the unlikely event the unexpended rocket motor, or portions of it, fall into the ocean is expected to be nil and without any substantial effect. See section . .2. for further discussion on propellant toxicity in seawater.

4.4.2.2.4 Ingestion of Pieces of Unburned Propellant

The parts of solid rocket motor propellant expelled from a destroyed or exploded rocket motor that fall into the ocean would most likely sink to the ocean floor at depths of thousands of feet. At such depths the propellant parts would be out of the way of feeding marine mammals.

4.4.2.2.5 Entanglement with the Submerged Parachute

Entanglement of a marine mammal in a 8. -m (28-ft) diameter parachute used to air drop the target/pallet assembly in the SR-ALT target missile option would be very unlikely since the mammal would have to swim into it or not detect it from above as the parachute sinks. Moreover, the chance of a mammal being in the same area and having physical contact with the parachute is remote. It is planned to recover everything that enters the water whenever possible, especially, the two 13.1-m (3-ft) diameter target vehicle main parachutes.

In terms of the potential for cumulative impacts, no other test flight operations are currently anticipated which would overlap with the Proposed Action hence there would be no potential for incremental, additive, cumulative impacts.

No mitigation measures for biological resources are proposed.

4.4.2.3 Health and Safety— Ocean Area (Outside U.S. Territory)

The pre-flight site modification/construction activities, the land-based operations andtraining, and base operations and maintenance activities would have no impact on the open ocean environment. Only the proposed TBMD test flight operations and training activities have the potential for impacts in the ocean environment. These are discussed below.

The Navy takes every reasonable precaution during the planning and execution of the test and development activities to prevent in ury to human life or property. PMRF conducts missile flight safety, which includes analysis of missile performance capabilities and limitations, of hazards inherent in missile operations and destruct systems, and of the electronic characteristics of missiles and instrumentation. It also includes computation and review of missile tra ectories and hazard area dimensions, review and approval of destruct systems proposals, and preparation of the Range Safety Approval and Range Safety Operational Plans required of all programs at PMRF.

Impact zones in the open ocean area would be delineated. The location and dimensions of the impact zones would vary for each test flight scenario. Impact zones for each test flight would be determined by range safety personnel based on detailed launch planning and tra ectory modeling. This planning and modeling would include analysis and identification of a flight corridor. Flights would be conducted when tra ectory modeling verifies that flight vehicles and debris would be contained within predetermined areas, all of which would be over the open ocean far removed from land and populated areas. Range safety officials would issue NOTAMs and NOTMARs, and the zones would be determined clear of both surface vessels and aircraft before proceeding with a flight test. Consequently, the Proposed Action would have no adverse impacts to public health and safety in the open ocean area. In addition, all activities must be in compliance with DOD Directive .1 (as enclosed by OPNAVINST 3 . A) which specifies procedures for conducting aircraft operations and for missile/pro ectile firing, namely the missile/pro ectile firing areas shall be selected so that tra ectories are clear of established oceanic air routes or areas of known surface or air activity.

In terms of the potential for cumulative impacts, no other test flight operations are currently anticipated which would overlap with the Proposed Action hence there would be no potential for incremental, additive, cumulative impacts.

No mitigation measures for health and safety are proposed.

4.4.2.4 Transportation— Ocean Area (Outside U.S. Territory)

Test flight operation and training activities have the potential for intercepted debris impacts to waters within the Temporary Operating Area that would normally be occupied by commercial shipping.

Though extensive, the ~~,33 ,8 2~~ .1 million km^2 (~~3,13 ,~~ 2.1 million nmi^2) Temporary Operating Area covers an area of the northern Pacific transited least frequently by commercial shipping (figure . .2. -1). The ma ority of international trade crossing the Pacific between Asia and North America uses routes of least-distance, usually via the great circle. Moreover, the actual intercept debris impact area would be much smaller than the Temporary Operating Area itself, depending on the individual intercept scenarios.

Furthermore, prior warning of flight testing and training would enable commercial shipping to follow alternative routes away from test areas. This process is simplified by the lack of any formal shipping lanes in the northern Pacific. Moreover, the rigorous safety procedures employed to determine that the operating areas are clear of surface vessels, detailed in section . .1. , ensure that no impacts to ocean transportation would occur.

In terms of the potential for cumulative impacts, all proposed test and training activities would take place in areas of minimal commercial shipping activity. Potential cumulative impacts could be further minimized by early notification procedures.

No mitigation measures for commercial shipping (transportation) are proposed.

4.4.2.5 Water Resources— Ocean Area (Outside U.S. Territory)

The pre-flight site modification/construction activities, the land-based operations and training, and base operations and maintenance activities would have no impact on the open ocean environment. Only the proposed TBMD test flight operations and training activities have the potential for impacts in the ocean environment. These are discussed below.

4.4.2.5.1 Land and Sea-launched Target Missiles

No significant water quality impacts are anticipated for the ocean area from nominal land or sea launches of TBMD target missile. The total emissions from hydrogen chloride and aluminum oxide from a nominal launch of an SR1 -AJ-1 rocket motor are 1,3 kg (3, 8 lb) and 1, 3 kg (3,88 lb), respectively. The potential for impacts from these emission~~s~~ products can be compared with the emissions from the ASRM program tests that produce over 1 times the emissions of the proposed TBMD rocket motor. Each static test of the ASRM emits 11 , 2 kg (2 , 8 lb) of hydrogen chloride and 1 ,3 . kg (32,88 lb) or aluminum oxide (National Aeronautics and Space Administration, 1). The ASRM produces a significantly larger ground cloud and therefore distributes emissions over a much larger area than the TBMD rocket motor, but emission concentrations at any point are expected to be lower for the smaller motor. (U.S. Army Space and Strategic Defense Command, 1 , p. - 1)

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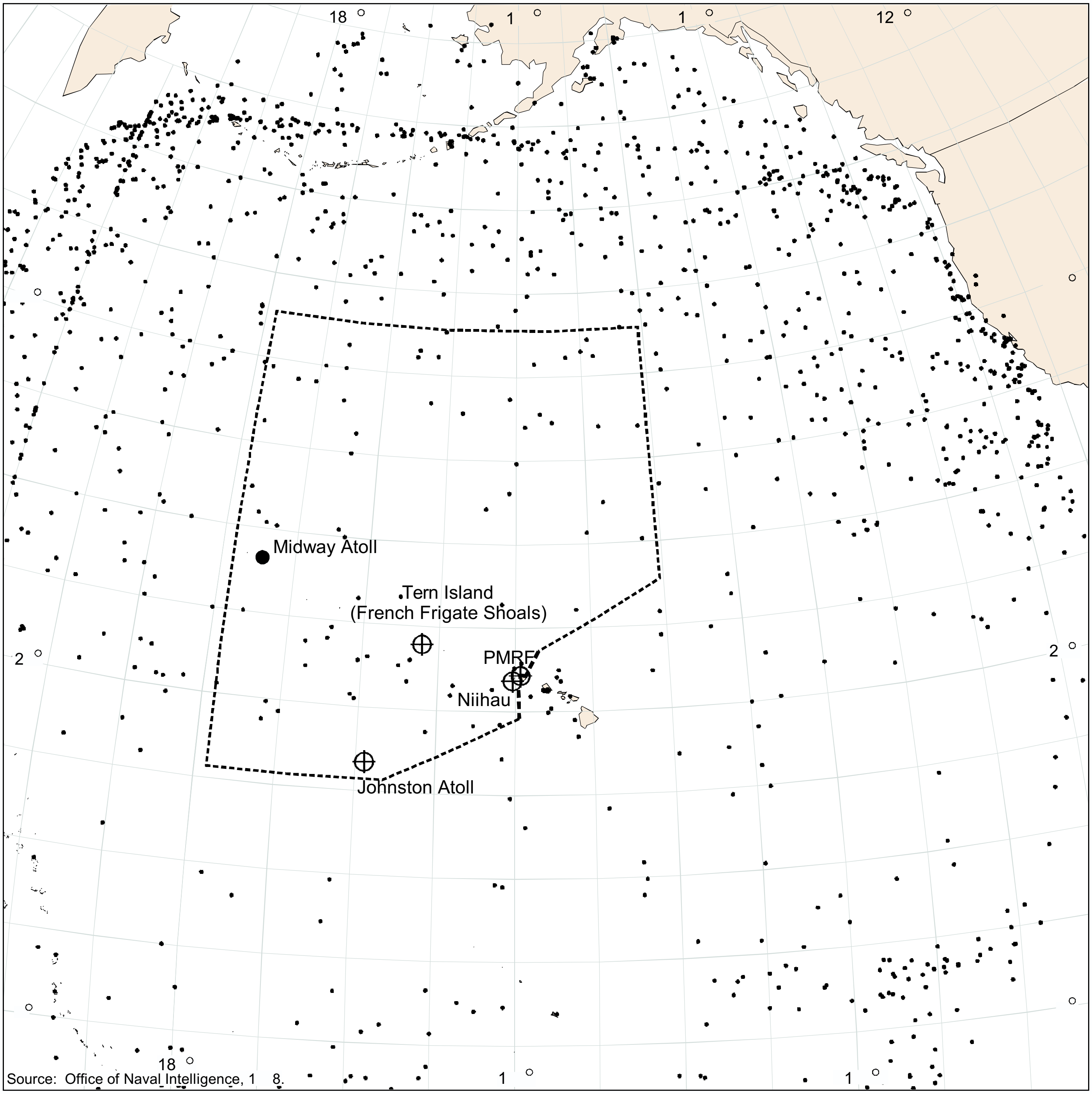

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EXPLANATION

- Ship
- Temporary Operating Area
- Midway (Geographical reference only)
- Candidate Sites

NORTH

Scale

8 8 Kilometers

223 8 Nautical Miles

Composite Snapshot of Ship Locations in the Temporary Operating Area (Revised)

Open Ocean

Figure 4.4.2.4-1

ocean tp 2

The effects of hydrogen chloride deposition were modeled from the ASRM. Under nominal launch conditions when the relative humidity is less than 1 percent, deposition of hydrogen chloride gas on the surface of the sea would not be significant. Analyses for the most conservative case, where rain would be present soon after test firing the ASRM, concluded that acid deposition to surface water would not result in any impacts to larger surface water bodies in the area. This analysis was based on the buffering capacity of fresh water which is considerably lower than the buffering capacity of sea water therefore, it is expected that even for the most conservative case condition where all of the hydrogen chloride emission falls over the open ocean area, the pH level would not be depressed by more than .2 standard units for more than a few minutes. (U.S. Army Space and Strategic Defense Command, 1 , p. -1) 133

Mathematical modeling results of ASRM tests indicated the maximum deposition of aluminum oxide would measure about 1. mg/m. Aluminum oxide is not considered toxic under natural conditions but may contribute potentially harmful species of soluble aluminum forms under acidic conditions. It is difficult to quantify the portion of aluminum oxide that reacts with hydrogen chloride to form additional toxic aluminum species. The most conservative approach assumes that all of the aluminum oxide deposited has reacted with hydrogen chloride. With this extremely conservative assumption, the deposition of about 1. mg/m^2 of aluminum oxide equals approximately . mg/L aluminum at a water depth of .1 m (. ft). This analysis is based on the assumption that it would not be raining at the time of the test event or within 2 hours after the event. Rain would increase the amount of deposition. (U.S. Army Space and Strategic Defense Command, 1 , p. -1 1) 133

It is also expected that even in the most conservative scenario of an on-ship or early flight failure where all of the propellant is ignited and all of the hydrogen chloride and aluminum oxide are deposited, any toxic concentration of these products would be buffered and diluted by sea water to non-toxic levels within minutes. Consequently, any impacts from accidental release would be very transient.

4.4.2.5.2 Air Launched Target Missiles

The Air Drop target configuration includes an SR-1 -AJ-1 (modified) Minuteman II rocket motor. The missile would be ignited at an altitude of 1, 2 m (, ft) and then rapidly ascend out of the atmosphere on a ballistic tra ectory. Chemical emissions from the fired launch vehicles will primarily be into the atmosphere. Other than the solid rocket motor fuels, listed hazardous material quantities aboard range from 18. kg (1lb) to 1. mg (both of gas generator propellants). The propellant, explosive, pyrotechnic, and hazardous components and devices aboard the Air Drop, except for flight termination system components such as batteries, will have been expended, or nearly expended upon the Air Drop re-entry into the atmosphere and subsequent entry into the ocean. (U.S. Department of the Navy, 1 , 1 Jul, p. -3) 1 8

The possibilities of water pollution are associated primarily with toxicmaterials which may be released and are soluble in the water environment. Rocket motor propellants are the dominant source of such materials. A potential source of pollutants from the SR-1 -AJ-1 (modified) rocket motor to the open ocean is the 232, 2 kg (13, 2 lb) of propellant.

The solid propellant is primarily composed of rubber (polybutadiene) mixed with AP. The AP contained within the matrix of rubber will dissolve slowly. While there is no definitive information on the solubility/toxicity of the propellant material in seawater, the toxicity is expected to be relatively low. As a most conservative case, toxic concentrations of AP would be expected only within a few yards of the source. (U.S. Department of the Navy, 1 , 1 Jul, p. -3) 1 8

In the event of an ignition failure or other launch mishap, a fueled rocket motor or portions of the unburned fuel would likely fall into ocean waters. In that case, small fragments of fuel may float on the surface of the sea for a time, and some dissolution may occur. However, the fragments will become waterlogged and sink (U.S. Department of the Navy, 1 , 1 Jul, p. -3). 1 8

In terms of the potential for cumulative impacts, the effect of any hydrogen chloride deposition in the open ocean area would be very transient due to the buffering capacity of sea water. Similarly, deposition of aluminum compounds would be very small and dispersal from surface mixing would be rapid. Therefore, no incremental, additive, cumulative impacts are anticipated.

NASA conducted a thorough evaluation of the effects of missile systems which are deposited in seawater. It concluded that the release of hazardous materials aboard missiles into seawater would not be significant. Materials would be rapidly diluted and, except for the immediate vicinity of the debris, would not be found at concentrations identified as producing any adverse. The Pacific Ocean depth in the vicinity of the launch area is thousands of ~~f~~eet deep, and consequently the water quality impact from the fuel is expected to be minimal. Any area affected by the slow dissolution of the propellant would be relatively small due to the size of the rocket motor or propellant pieces relative to the quantity of seawater (U.S. Department of the Navy, 1 , 1 Jul, p. -). 1 8

In terms of the potential for cumulative impacts, the effect of any propellant fuel deposition in the open ocean area would be very transient and dispersal from surface mixing would be rapid. Therefore, no incremental, additive, cumulative impacts are anticipated.

No mitigation measures for water resources are proposed.

4.5 ENVIRONMENTAL JUSTICE

As described in section 3. , a disproportionately high percentage of low-income, and minority populations have been identified in 1 of 13 census tracts within Kauai County (including Niihau). The following discussion provides an analysis of Environmental Justice concerns identified by the public during the outreach process or identified through this EIS preparation process. The impact analysis is grouped into the following resource categories ~~by~~ for Kauai and Niihau: air quality, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, visual and aesthetic resources, and water resources. There are expected to be minimal impacts to airspace use, transportation, and utilities on both Kauai and Niihau and no Environmental Justice issues have been identified. In addition, since no impacts were identified at any of the PMRF and DOE sites on Oahu and Maui, there would be no Environmental Justice concerns. Since there are no residential populations on Kaula, Tern Island, or Johnston Atoll except for mission-related personnel, there are no Environmental Justice issues. The Environmental Justice analysis below discusses potential disproportionate environmental and health impacts to low-income and minority groups.

4.5.1 KAUAI

4.5.1.1 Air Quality— Kauai

Environmental Justice concerns associated with air quality would occur if the current air quality attainment status would change as a result of either the No-action Alternative or Proposed Action or if air emissions exceed a health based standard in a low-income or minority area region. Results of analysis conducted for activities on the Island of Kauai for either the No-action Alternative or Proposed Action determined that there would be no change to the current attainment status on the island and no health based air quality standards would be exceeded in low-income and minority neighborhoods.

4.5.1.2 Biological Resources— Kauai

Environmental Justice concerns associated with biological resources would occur if local subsistence food sources (e.g., fish) would be adversely impacted by operations at PMRF. As discussed under the biological resources section, vegetation and wildlife are not expected to be affected by PMRF operations under either the No-action Alternative or Proposed Action.

4.5.1.3 Cultural Resources— Kauai

Potential Environmental Justice concerns would be associated with impacting any traditional resources on the Island of Kauai. Activities under either the No-action Alternative or Proposed Action would not impact any traditional resources. Although access may be denied to some traditional resource areas within the ground hazard area during launch activities for safety purposes, this would only be temporary. PMRF would consult with the SHPO and the Office of Hawaiian Affairs prior to any construction pro ect.

4.5.1.4 Geology and Soils— Kauai

The potential impacts to geology and soils from the No-action Alternative and the Proposed Action would occur from construction related ground disturbance and the potential for soil contamination. There are no low-income or minority populations within a geology and soils region of influence. However, there is the potential for low-income and minority populations to come in contact with soils (i.e., the beach) that could be affected by rocket emissions and hazardous materials. Sampling of areas on PMRF where missile launches have occurred have shown no hazardous levels within the soils that could affect the public and any spill that would occur would be quickly remediated to prevent any soil contamination. Additional launch activity under the Proposed Action is not expected to affect local soil resources.

4.5.1.5 Hazardous Materials and Hazardous Waste— Kauai

All hazardous materials used and hazardous waste generated by PMRF on Kauai would be conducted in accordance with Federal and State regulations. There are no low-income or minority populations residing ad acent to PMRF locations where most of the hazardous materials and waste operations would occur. PMRF IRP sites do not affect off-base areas and do not impact use of the beach in front of the installation. Any hazardous materials that would result from an early flight termination would be cleared from the ground hazard area and any contamination would be remediated. Potential issues involving the transportation of hazardous materials is addressed under health and safety.

4.5.1.6 Health and Safety— Kauai

As addressed in the health and safety sections for PMRF activities on Kauai, thereare minimal health and safety risks associated with PMRF activities under the No-action Alternative and enhanced capability activities under the Proposed Action. In addition, there are no low-income or minority population areas within the health and safety region of influence locations on Kauai, except during the transportation of hazardous materials on Kauai roads. These materials could be transported on SH through the towns on thewest side of the island. If a mishap were to occur there is the potential that some of these materials (mainly solid and liquid propellants) would represent a health and safety issue to low-income and minority groups along the route (see section .1.1.). However, the probability of a mishap is low, and PMRF would implement safety procedures to minimize the chance of a mishap, as well as the expedient remediation of the problem ~~and~~ if one should occur. ~~quickly remediate the problem.~~ In addition, PMRF may utilize other transportation methods that would not use SH and would bring the hazardous materials directly in to PMRF by either barge or aircraft depending on DOT requirements and sea conditions. Sea and air transportation options would not impact any low-income or minority neighborhoods

Some low-income and minority populations do use the ocean ad acent to PMRF for subsistence fishing. As discussed under biological resources, there would be no impacts to local fish species as a result of the No-action Alternative and Proposed Action and local water quality would not be affected therefore, there would be a low potential for any contaminants to get into the food chain and affect the health of people using fish or other food sources for subsistence.

4.5.1.7 Land Use— Kauai

The potential impacts to land use from the No-action Alternative and the Proposed Action would occur from the addition of new facilities, potential incompatible land uses, and restriction of access to popular beach, fishing, and hunting areas. All of the PMRF activities on Kauai occur ad acent to compatible land uses. There are no residential land use areas that would be affected by either No-action Alternative or Proposed Action activities. However, low-income and minority populations do use the ocean ad acent to PMRF for subsistence fishing, and hunt near some of the PMRF support sites on Kauai. According to a survey conducted fora the Commercial Satellite Launching Facility (State of Hawaii, 1 3, Aug, p. -1), residents place a 1
high value on traditional fishing and gathering activities and on Hawaiian customs and practices. The availability of an

alternate source of food gives residents a sense of self-sufficiency and freedom and reduces dependence on a cash economy. Subsistence activities, therefore, are important in supplementing relatively low family incomes, as well as maintaining the preferred lifestyle of community.

As discussed under land use, PMRF does allow access to their beaches for fishing and some of these areas would be restricted during hazardous operations. The overall areas restricted on PMRF would consist mostly of Recreation Areas 1 and 2 with the remainder of the base (Recreation Area 3) open for use. Because other areas on western Kauai (including Polihale State Park) would be available for use, the closure area represents less than 1 percent of the area on western Kauai. PMRF does give advance notification through a 2 -hour hotline of closure times, so minimal impacts to subsistence fishing are expected. Closure of the southern portion of Polihale State Park would occur no more than 3 minutes per launch or up to 1 hours total per year and would only affect the southern end of the park, which would only affect the ability of low income and minority populations to subsistence fish for short periods during the year. No hunting areas would be impacted by PMRF activities.

4.5.1.8 Noise— Kauai

As discussed under the noise sections for PMRF activities on the I~~i~~sland of Kauai, there are expected to be minimal impacts for noise generating activities. Construction related noise at the various sites on the island would be temporary in nature and would only affect a very limited area. Construction related noise would not impact any low-income or minority residential areas on the island. Launch related noise may be quite high under both the No-action Alternative and Proposed Action. However, none of the noise levels would exceed either DOD or OSHA safety requirements outside of the ground hazard area where non-essential personnel and the public are excluded (during launches) ~~would exceed either DOD or OSHA safety requirements~~. Personnel within the ground hazard area would wear hearing protection devices. Noise levels from launches from the southern end of PMRF may startle, awaken, or distract low-income and minority neighborhoods in the town of Kekaha. However, the number of launches from southern PMRF would be infrequent with most occurring on the northern end of the island. Operation of aircraft on PMRF occurs near the base, and noise levels occur over unpopulated sugar cane fields. Other noise generating activities at PMRF occur near the source and are not expected to impact any low-income or minority areas.

4.5.1.9 Socioeconomics— Kauai

As discussed under the socioeconomic sections for PMRF, the activities under the No-action Alternative and the Proposed Action would provide an economic benefit to the I~~i~~sland of Kauai. The opportunities and economic benefit provided by PMRF helps support all industries on Kauai and assists both low-income and minority populations. The potential restriction of areas used for commercial fishing and tourist related industries does not affect those industries. Potential impacts to subsistence fishing and gathering activities is addressed above under land use.

4.5.1.10 Visual and Aesthetic Resources— Kauai

As described under the visual resources sections for PMRF locations on Kauai there would be minimal impact to any prominent vistas as a result of No-action Alternative or Proposed Action activities. None of the proposed construction would occur near low-income or minority neighborhoods.

4.5.1.11 Water Resources— Kauai

The potential impacts to water resources from the No-action Alternative and the Proposed Action would occur from construction related ground disturbance and the potential for water pollution from PMRF activities. There are no low-income or minority populations within a water resource s region of influence. However, there is the potential for low-income and minority populations to come in contact with water (i.e., the beach) that could be affected by rocket emissions and hazardous materials. Sampling of areas on PMRF where missile launches have occurred have shown no water levels exceeding health based standards and any spill that would occur would be quickly remediated to prevent any water contamination. Additional launch activity under the Proposed Action is not expected to affect local water resources.

4.5.2 NIIHAU

4.5.2.1 Air Quality—Niihau

Environmental Justice concerns associated with air quality would occur if the current air quality attainment status would change as a result of either the No-action Alternative or Proposed Action or if air emissions exceed a health based standards. Results of analysis conducted for activities on the Island of Niihau for either the No-action Alternative or Proposed Action determined that there would be no change to the current attainment status on the island and no health based air quality standards would be exceeded beyond the ground hazard area boundary where the public is excluded. No air emission generating activities on Niihau would affect the village.

4.5.2.2 Biological Resources—Niihau

Environmental Justice concerns associated with biological resources would occur if local subsistence food sources (e.g., fish and other food sources) would be adversely impacted by PMRF, TBMD, or TMD operations. As discussed under the biological resources section, vegetation and wildlife are not expected to be affected by operations under either the No-action Alternative or Proposed Action if specific mitigations are implemented. These mitigations would consist of providing fire equipment on the island during hazardous operations to minimize the potential for a catastrophic fire.

4.5.2.3 Cultural Resources—Niihau

Potential Environmental Justice concerns would be associated with impacting any traditional resources on the Island of Niihau. No traditional resources areas o~~f~~ areas associated with traditional values or beliefs have been identified for the potential facility siting areas on Niihau. Niihau s elders were consulted with regards to selection of these areas in order to ensure that traditional cultural values and beliefs would not be compromised by any Proposed Actions at these locations.

4.5.2.4 Geology and Soils—Niihau

The potential impacts to geology and soils from the No-action Alternative and the Proposed Action could occur from construction related ground disturbance and the potential for soil contamination. Soil disturbance as a result of construction would be temporary and not result in any soil impacts. No significant changes to soil chemistry would occur as a result of missile launching activity, and any mishap or spill of hazardous materials would be quicklyremediated to prevent any soils contamination.

4.5.2.5 Hazardous Materials and Hazardous Waste—Niihau

There would be minimal hazardous materials used and hazardous waste generated as a result of proposed activities under the No-action Alternative and Proposed Action. Use and generation of hazardous materials and waste would be conducted in accordance with Federal and State regulations. Any spill of these materials would be quicklyremediated, and PMRF would keep appropriate spill containment devices on the island for the types of hazardous materials expected to be used. Any hazardous materials that would result from an early flight termination would be cleared from the ground hazard area and any contamination would be remediated. Potential issues involving the transportation of hazardousmaterials is addressed under health and safety.

4.5.2.6 Health and Safety—Niihau

As addressed in the health and safety sections for PMRF, TBMD, and TMD activities onNiihau (see section .2.1.), there are minimal health and safety risks associated with activities under the No-action Alternative and enhanced capability activities under the Proposed Action. During all operations on the island, PMRF would take every precaution to protect the island inhabitants and environment. During launch operations all personnel would be excluded from those areas where there would be the ~~potential~~possibility for potentially hazardous debris from a missile mishap to fall. At no time would the village area on the island be included within the ground hazard area or ESQD required for missile launch activities. The use of pre-packaged liquid propellants on the north end of the island could present a health and safety risk to island residents however, modeling conducted showed that an accidental spill of liquid propellants would not impact the village area. In addition, the possibility of a mishap is low and if one should occur PMRF would quickly remediate the problem.

Island residents do use the ocean and land onNiihau for subsistence food sources. As discussed under biological resources, there would be no impacts to local fish species and other food sources as a result of the No-action Alternative and Proposed Action, and local water and soil quality would not be affected therefore, there would be a low potential for any contaminates to get into the food chain and affect the health of people using fish or other food sources for subsistence.

EMR generated under both the No-action Alternative andProposed Action would have appropriate exclusion zones to eliminate health hazards to island residents.

4.5.2.7 Land Use—Niihau

The potential impacts to land use from the Proposed Action would occur from the addition of new facilities, potential incompatible land uses, and restriction of access to, fishing, and gathering areas on Niihau. The No-action Alternative does not affect access to fishing and gathering areas and the PMRF activities are compatible with the open/grazing uses of the island. Under the Proposed Action, PMRF activities on Niihau would occur ad acent to compatible open/grazing land uses. None of the proposed activities would impact the village on Niihau. As discussed above, fishing and gathering activities are important to the residents of Niihau. Under the Proposed Action, some areas would be restricted from use during pre-launch and launch activities. The land within the ESQDs associated with pre-launch activities could restrict use within a 381-m (1,2 -ft) area for up to days a year. However, the land within the ESQDs is used mostly for grazing by island live stock which would be allowed to continue within the safety area.

Under launch activities a ground hazard area would be established that would restrict access to fishing and shell gathering locations on both northern and southern ends of the island, depending on what launch location would be used. However, this would occur for no more than hours per year and would not result in a substantial loss of time for these activities. Grazing would be allowed to continue within the ground hazard area during launch activities. The remainder of the island would be available for fishing and gathering activities during launch activities.

4.5.2.8 Noise—Niihau

There would be minimal noise generated under the No-action Alternative on the Island of Niihau and the general ambient conditions on the island represent a natural environment. While the increase in background noise levels under the TBMD and TMD programs may be dramatic, the lack of any other external noise sources results in only a limited increase in the background noise levels. However, due to the limited contact with off-island noise sources, this limited increase may be perceived as being quite invasive. This may be particularly true of the intense sound levels generated during missile launches. However, none of the noise levels outside of the ground hazard area where non-essential personnel and the public are excluded for these launch locations would exceed either DOD or OSHA safety requirements. Personnel within the ground hazard area would wear hearing protection devices. Personnel and island residents outside of the ground hazard area may be startled, awakened, or distracted by the launch noise. However, it is expected that all island residents would be informed of a launch prior to it occurring. Other related noise such as site generators would occur near a facility and would not be expected to affect the overall noise environment on the island. No adverse impact is expected for the island village.

4.5.2.9 Socioeconomics—Niihau

Environmental J~~j~~ustice deals with potentially significant impacts from the proposed pro ect that could occur in impact areas with identifiable racial minorities or who are significantly impoverished. Following the discussion in preceding section 3. .3 and all of chapter ~~section~~ . , we concluded that such treatment is required for the I~~i~~sland of Niihau.

Discussion of existing circumstances relevant to an environment ustice assessment for Niihau was contained in section 3. . . Assessments of potentially significant material and cultural impacts upon the people of Niihau, together with required mitigation, are outlined in prior section .2.1.1 , and in other parts of chapter ~~section~~ . , to enhance document readability. They are incorporated here by reference.

The Navy and Niihau Ranch have a verifiable ongoing record pursuing activities that provide benefits for the Navy and for Niihau, while protecting Niihau s lifestyle and culture. The proposed additional activities that are the sub ect of this EIS will expand those benefits. A Protection Agreement is in place, and is effectively protecting Niihau lifestyle and culture at existing activity levels. Specific measures have been identified to expand and strengthen that agreement, as required, as additional military activities are sited on the island. On this basis, it is concluded that the Hawaiian people of Niihau will not be adversely affected by the P~~p~~roposed A~~a~~ction, relative to residents of Kauai, the ~~s~~State of Hawaii or the United States. In fact, they will benefit from it.

4.5.2.10 Visual and Aesthetic Resources-Niihau

Although much of the natural vegetation on Niihau has changed as a result of grazing, the island still represents a relatively undeveloped natural appearance. The few new permanent facilities that are planed for the island would contribute to visual impacts bringing in a more developed nature to the island especially on the southern and northern ends of the island. Most of the new facilities would not be visible from the island village and would only block prominent vistas if island residents are in the vicinity of the facility. Overall, the addition of facilities under the Proposed Action would increase the number of out-of-character elements to the Island of Niihau.

4.5.2.11 Water Resources-Niihau

The potential impacts to water resources from the No-action Alternative and the Proposed Action would occur from construction related ground disturbance and the potential for water pollution from PMRF activities. Sampling of areas on PMRF where missile launches have occurred have shown no water levels exceeding health based standards and any spill that would occur would be quickly remediated to prevent any water contamination. It is expected that launch activities under the Proposed Action (eight launches per year) would not impact local water resources used by Niihau residents or the subsistence wildlife or impact ocean water quality around the island.

4.6 CONFLICTS WITH FEDERAL, REGIONAL, STATE AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS

Neither the No-action Alternative nor the Proposed Action conflicts with any land use plans, policies, or controls. A determination of compatibility on the use of Tern Island within the Hawaiian Island National Wildlife Refuge would~~ill~~ be made by the USFWS. This compatibility determination would~~ill~~ be based on the intended purpose of the refuge and the activities planned for that site. PMRF would revise the current restrictive easement with the State of Hawaii for the continued use of lands for safety purposes ad acent to the facility for missile launching activities. In addition, PMRF would obtain a lease and restrictive easement for the construction and use of two new ordnance storage magazines on Kauai.

4.7 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

The increased activities for TBMD and TMD would require additional energy requirements at Makaha Ridge and at Niihau, Tern, and Johnston Atoll. Except for Makaha Ridge these energy requirements would be met by using portable generators. At Makaha Ridge, the existing electrical feed from Kauai Electric would be upgraded. PMRF would continue to implement energy conservation programs.

4.8 NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS

Other than various structural materials, components (e.g., electronics, defensive interceptors) required for testing, and fuels, no significant natural or depletable resources would be required.

4.9 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Unavoidable short-term effects would be associated with temporary closure of the southern portion of Polihale State Park and access road to the park, areas on Niihau, and areas ~~along the front of~~ ad acent to PMRF during missile launching activities and range activities. However, the amount of closure time would not result in any long-term impacts to recreational or subsistence fishing uses. In addition, there would be some short-term disruption of fishing by ships within the PMRF overwater range.

Other unavoidable effects such as the startling of wildlife, adverse impacts to marine and terrestrial species and some threatened and endangered species would result from missile launching activities on Kauai, Niihau, ~~and~~ Tern Island~~s~~, and Johnston Atoll. In addition, noise from Navy ship use may also impact marine species. Noise from other PMRF activities such as helicopters and aircraft may also startle wildlife. The impacts from these noise sources would be short-term and are not expected to eopardized the existence of any threatened, endangered, or marine species. Noise from missile launching activities may also startle some residents on the l~~I~~slands of Kauai and Niihau.

Use of Kaula for Navy aerial target and inert bombing practice would continue to startle wildlife on the island. Geology and soil conditions on Kaula w~~c~~ould be ~~impacted~~ adversely impacted by current and ongoing activities.

Additionally, water utilities servicing Makaha Ridge and Kokee would experience adverse impacts from the Proposed Action, until the scheduled well has been dug.

4.10 RELATIONSHIP BETWEEN SHORT-TERM USES OF MANS ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Most activities would occur on existing facilities dedicated to the support of testing programs. Some new development would occur on the Island of Niihau which would result in the loss of land used for grazing. However, the program activities would not result in the elimination of any options for the future use of the environment.

4.11 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under both the No-action Alternative and Proposed Action there would be a limited use of irretrievable resources (e.g., fuel, construction materials, labor) and no significant impacts to natural or cultural resources. Proposed Activities would not result in the change of any existing land uses and would not irreversibly~~e~~ curtail the range of potential uses of the environment.

4.12 SUMMARY OF UNRESOLVED ISSUES

There are no unresolved issues to the No-action Alternative and Proposed Action.

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