Draft

ENVIRONMENTAL ASSESSMENT

FOR

CONSTRUCTION OF FACILITIES AND ASSOCIATED INFRASTRUCTURE

AT THE

GUAM NATIONAL WILDLIFE REFUGE, RITIDIAN UNIT

DEDEDO, GUAM

UID#: EAXX-007-17-XMC-1722260043

August 2024

This page intentionally left blank.

Abstract

Designation:	**Environmental Assessment**
Title of Proposed Action:	**Construction of Facilities and Associated Infrastructure at the Guam National Wildlife Refuge, Ritidian Unit**
Project Location:	**Dededo, Guam**
Cooperating Agencies:	**United States Fish and Wildlife Service**
Action Proponent:	**Marine Corps Installations Command**
Point of Contact:	**EV21 Project Mgr., Ritidian Unit Facility Construction EA** **Email: NFPAC-Receive@navy.mil** **Naval Facilities Engineering Systems Command, Pacific** **258 Makalapa Dr, Ste 100** **Joint Base Pearl Harbor-Hickam, HI 96860-3134**
Unique ID #:	**EAXX-007-17-XMC-1722260043**
Date:	**August 2024**

The United States (U.S.) Marine Corps prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (42 U.S. Code [U.S.C.] sections 4321, et seq.), the Council on Environmental Quality implementing regulations (40 Code of Federal Regulations Parts 1500–1508), and Marine Corps Order 5090.2. The proposed action is to construct new U.S. Department of the Interior (DOI) facilities and associated infrastructure at the Ritidian Unit of the Guam National Wildlife Refuge. New DOI facilities are required to replace existing facilities that fall within a U.S. Marine Corps live fire training range surface danger zone that overlays a portion of the Refuge.

This EA evaluates the potential environmental impacts of two action alternatives and the No-Action Alternative to the following resources: terrestrial biological resources, cultural resources, recreation, visual resources, socioeconomics, environmental justice, noise, water resources, geology and soils, and utilities. The proposed action would result in less than significant impacts to these resources. Potential impacts to the following additional resource areas would be negligible or nonexistent: air quality and greenhouse gas emissions, hazardous materials and waste, marine biological resources, public health and safety, transportation, and land use.

This page intentionally left blank.

Summary

S.1 Proposed Action

The United States (U.S.) Marine Corps proposes to construct replacement facilities and associated infrastructure for the U.S. Department of the Interior (DOI) (including the U.S. Fish and Wildlife Service [USFWS] and U.S. Geological Survey [USGS]) at the Ritidian Unit of the Guam National Wildlife Refuge ("the Refuge"). The proposed action also includes road improvements and development of an alternate public access route from the newly constructed facilities to other publicly accessible portions of the Refuge, demolition of the existing DOI facilities, and preparation of the demolition area for potential habitat restoration and regeneration.

S.2 Purpose and Need for the Proposed Action

The purpose of the proposed action is to provide DOI replacement facilities pursuant to Section 2822 of the 2015 National Defense Authorization Act (NDAA) and the 2020 Memorandum of Agreement (MOA) between the DOI and the Department of the Navy (DON) (Appendix A). The action is needed to enable the USFWS to continue its management of the Refuge and USGS to continue its Brown Tree Snake (BTS) Research and Rapid Response program at the Refuge in accordance with their respective legislative authorities (see Section 1.4), while enabling the Marine Corps to train to meet its Title 10 readiness requirements.

S.3 Alternatives Considered

DON planners applied alternatives screening criteria and the results of natural and cultural resource surveys to identify a "focus area" of approximately 7.5 acres for siting of the proposed new facilities. Under Alternative 1, the required DOI facilities and infrastructure would be developed as separate, single-story buildings in a campus-like configuration that would potentially involve development of the entire focus area. Alternative 2 would include the same functional components as Alternative 1 but with certain USFWS and USGS functions consolidated into a two-story building configuration. The reduced footprint for Alternative 2 within the focus area is estimated to be approximately 4.5 acres. As with Alternative 1, the impact assessment for the Alternative 2 configuration assumes the facility complex could be constructed in any part of the focus area. Alternative 2 would include similar installation of utilities and other facility infrastructure as Alternative 1, the same demolition and site preparation at the existing DOI facility location, and the same road improvements. Including all project components, Alternative 1 would have an estimated total project footprint of 22.46 acres and Alternative 2 would have a total footprint of 19.46 acres.

S.4 Summary of Environmental Resources Evaluated

The National Environmental Policy Act (NEPA) and applicable implementing regulations specify that an Environmental Assessment (EA) should address those resource areas potentially subject to impacts. In addition, the level of analysis should be commensurate with the anticipated level of environmental impact. Environmental resources carried forward for analysis in this EA include terrestrial biological resources, cultural resources, recreation, visual resources, socioeconomics, environmental justice, noise, water resources, geology and soils, and utilities.

The following resources were not evaluated in detail in this EA because potential impacts would be negligible or nonexistent: air quality and greenhouse gas (GHG) emissions, hazardous materials and waste, marine biological resources, public health and safety, transportation, and land use.

S.5 Public and Agency Participation and Intergovernmental Coordination

The Marine Corps is soliciting public and agency input regarding the proposed action through publication of this Draft EA. Appendix C describes the process followed for distribution of the Draft EA for public and agency participation, and the Final EA will include responses to comments. The Marine Corps will consider comments received during the public comment period prior to rendering a decision on the proposed action. All consultations and coordination with regulatory agencies listed below will be complete prior to the Final EA.

In accordance with the 2011 Programmatic Agreement, which established the National Historic Preservation Act (NHPA) Section 106 compliance process for DON activities on Guam and in the Commonwealth of the Northern Mariana Islands (CNMI), the Marine Corps is consulting with the Guam State Historic Preservation Officer (GSHPO), interested parties, and the public on the proposed undertaking.

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA), the Marine Corps is conducting formal consultation with the USFWS regarding potential impacts to ESA-listed species and designated critical habitat.

The Marine Corps is preparing an effects test and determination under the Coastal Zone Management Act (CZMA) in accordance with local guidance (Guam Bureau of Statistics and Plans 2011).

The USFWS Pacific Region accepted the Marine Corps invitation to participate as a cooperating agency for this EA per 40 Code of Federal Regulations (CFR) Section 1508.1(g).

S.6 Summary of Potential Environmental Consequences

Table S-1 presents a summary of potential environmental impacts associated with Alternatives 1 and 2 and the No-Action Alternative.

Table S-1 Summary of Potential Impacts

Resources	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Terrestrial Biological Resources	• Impacts to vegetation, wildlife, critical habitat, and ESA-listed species would be less than significant. • Within the 22.46-acre project footprint, a total of 10.75 acres of designated critical habitat would be cleared and developed for Alternative 1. • *Cycas micronesica* trees within the affected area would be transplanted, maintained, and monitored within the forest enhancement areas at MCB Camp Blaz. • Three areas on the Refuge totaling 5.02 acres, currently in critical habitat but outside of the project area, would be netted to exclude ungulates for conservation benefit and outplanted with critical habitat primary constituent element plant species to enhance the habitat. • General and species-specific conservation measures would be required under the proposed action to avoid potential impacts to ESA-listed species (e.g., pre-construction monitoring, cycad transplanting, lighting requirements, and plant habitat protection).	• Impacts would be similar to Alternative 1 but reduced due to the smaller disturbance area. • Alternative 2 would have a smaller disturbance area than Alternative 1 with a total of 7.75 acres of critical habitat cleared and developed for Alternative 2. • No difference from Alternative 1 for transplanted *C. micronesica* trees. • No difference to netted areas or conservation measures for ESA-listed species.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impacts to terrestrial biological resources.

Resources	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Cultural Resources	• Less than significant impacts. • Potential adverse effects to two known NRHP-eligible archaeological sites would be minimized through Avoidance and Minimization Measures, including site design and planning • If adverse effects are unavoidable then mitigation measures would occur in accordance with the 2011 PA.	• Less than significant impacts. • Impacts to cultural resources would be similar to Alternative 1, but with a reduced construction footprint. • If the two NRHP-eligible sites cannot be avoided with the smaller footprint, the impacts and mitigation would be identical to Alternative 1, resulting in less than significant impacts to cultural resources.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to cultural resources.
Recreation	• Less than significant impacts. • During the construction phase of the proposed action, some minor detours or temporary delays to recreational access may occur, but most access would be unaffected. • After new facility construction and road improvements are completed, the proposed action would result in beneficial impacts to recreation by providing additional access options with the publicly accessible portions of the Refuge, including during periods when the SDZ is activated and when it is not activated.	• Less than significant impacts. • The same construction-phase adverse impacts and post-construction beneficial impacts associated with access to publicly accessible portions of the Refuge as Alternative 1. • Alternative 2 would be a less efficient configuration than Alternative 1 for conducting USFWS and USGS mission activities, and consolidation of operations in a two-story building would diminish the visitor experience and reduce accessibility and functionality within the building.	• Under the No-Action Alternative, the proposed replacement of existing DOI facilities would not occur. There would be no public or staff access to the current DOI facilities (including the Nature Center), or the recreational resources located within the SDZ when the SDZ is activated for training on the MPMG Range. There would also be no alternate public access to other publicly accessible portions of the Refuge outside the SDZ. While access to the existing DOI facilities would be available when the SDZ is not activated, the DOI's ability to manage the Refuge and achieve the purposes for which the Refuge was established would be severely constrained under such conditions. For these reasons, the No-Action Alternative would result in a significant impact to recreation.

Resources	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Visual Resources	• Less than significant impacts. • Construction and demolition of DOI facilities and associated infrastructure would have less than significant impacts. • The preparation of the site for potential habitat restoration and regeneration would result in a beneficial impact to visual resources.	• Less than significant impacts. • Impacts from Alternative 2 would be similar to Alternative 1. • The two-story building would be more visible in height but would still appear relatively small in scale. The height would diminish as the setback increases from the roadside and could diminish further if vegetation were kept intact or planted to screen the buildings.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to visual resources.
Socioeconomics	• Less than significant impacts. • The proposed action would have temporary positive impacts on employment and the local economy. • No impacts to Guam's resident population or the local housing market. • Less than significant impacts to community cohesion.	• Less than significant impacts. • Same as Alternative 1.	• Under the No-Action Alternative, there would be no increase in demand for construction labor or materials, and there would be no change in existing socioeconomic conditions.

Resources	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Environmental Justice	• Because none of the resource impacts identified in this EA would disproportionately affect minority or low-income populations, there would be no environmental justice impact to communities with environmental justice concerns. • If any school field trips were to occur during construction or be deferred until after construction of the DOI facilities, then children could potentially be affected disproportionately by reduced access to recreation. However, the identified impacts would not involve risks to the health or safety of children, would be temporary in nature, and all resource impacts would be less than significant. Therefore, the potential environmental justice impact to children would be less than significant.	• Same as Alternative 1.	• The only impacts that would result from the No-Action Alternative would be to recreation (see above and Section 3.4.2.1). These impacts would include restricted public and DOI staff access to Refuge facilities within the SDZ whenever training occurs on the MPMG Range, and no alternate public access to other publicly accessible portions of the Refuge outside the SDZ. The DOI's ability to manage the Refuge and achieve the purposes for which the Refuge was established would be severely constrained under such conditions. However, these impacts would affect all populations equally and no minority, low-income, or child populations would be affected disproportionately. Therefore, under the No-Action Alternative there would be no impacts to environmental justice.
Noise	• Less than significant impacts. • Construction would be localized, temporary, and primarily occur during daytime hours.	• Less than significant impacts. • Same as Alternative 1.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to the noise environment.
Water Resources	• Less than significant impacts. • The proposed action would follow the USEPA NPDES Construction General Permit. • The proposed action would follow a site-specific SWPPP, conservation measures, and stormwater runoff protection measures.	• Less than significant impacts. • Impacts from Alternative 2 would be similar to Alternative 1 but with a reduced construction footprint. • The area of new impervious surfaces would be less than Alternative 1 resulting in a small decrease in the amount of surface runoff.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to water resources.

Resources	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Geology and Soils	• Less than significant impacts. • The proposed action would follow the USEPA NPDES Construction General Permit. • The proposed action would follow a site-specific SWPPP, conservation measures, and stormwater runoff protection measures. • Proposed facilities would be located on relatively level areas that would not be subject to slope instability.	• Less than significant impacts. • Impacts from Alternative 2 would be similar to Alternative 1. • Alternative 2 would have a smaller disturbance area (4.51 acres) than Alternative 1.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to geology and soils.
Utilities	• Less than significant impacts. • The replacement facilities would be approximately the same size but more modern and energy-efficient than the existing DOI facilities, so the overall utilities usage would be reduced. • The proposed new septic and leach field wastewater system and abandonment of the existing system would have minor beneficial effects.	• Less than significant impacts. • Impacts from Alternative 2 would be similar to Alternative 1.	• Under the No-Action Alternative, the proposed action would not occur and there would be no impact to utilities.

Legend: DOI = Department of the Interior; EA = Environmental Assessment; ESA = Endangered Species Act; MCB = Marine Corps Base; MPMG = Multi-purpose Machine Gun; NPDES = National Pollutant Discharge Elimination System; NRHP = National Register of Historic Places; PA = Programmatic Agreement; SDZ = Surface Danger Zone; SWPPP = Stormwater Pollution Prevention Plan; USEPA = United States Environmental Protection Agency.

This page intentionally left blank.

Draft
Environmental Assessment
Construction of Facilities and Associated Infrastructure at the Guam National Wildlife Refuge, Ritidian Unit

Table of Contents

Abstract ..... **Abstract-i**

Summary **S-1**

Abbreviations and Acronyms ..... **vi**

1 Purpose and Need for Proposed Action **1-1**

1.1 Introduction 1-1

1.2 Background 1-2

1.3 Location 1-2

1.4 Purpose of and Need for the Proposed Action 1-4

1.5 Scope of Environmental Analysis 1-4

1.6 Relevant Laws and Regulations 1-4

1.7 Public and Agency Participation and Intergovernmental Coordination 1-4

2 Proposed Action and Alternatives **2-1**

2.1 Proposed Action 2-1

2.1.1 Construction of Replacement DOI Facilities and Associated Infrastructure 2-1

2.1.2 Alternate Access Route to Publicly Accessible Areas within the Refuge 2-2

2.1.3 Demolition of Existing Facilities and Preparation of the Site for Potential Habitat Restoration and Regeneration 2-3

2.1.4 Project Implementation 2-3

2.2 Alternatives Development 2-4

2.2.1 Alternatives Criteria 2-4

2.2.2 Alternative 1 2-10

2.2.3 Alternative 2 2-12

2.2.4 Alternatives Considered but Not Carried Forward for Further Analysis 2-13

2.3 No-Action Alternative 2-13

2.4 Avoidance and Minimization Measures Included in the Proposed Action 2-13

3 Affected Environment and Environmental Consequences **3-1**

3.1 Scope of Analysis 3-1

3.2 Terrestrial Biological Resources 3-6
3.2.1 Affected Environment 3-6
3.2.2 Environmental Consequences 3-19
3.3 Cultural Resources 3-41
3.3.1 Affected Environment 3-42
3.3.2 Environmental Consequences 3-44
3.4 Recreation 3-46
3.4.1 Affected Environment 3-46
3.4.2 Environmental Consequences 3-48
3.5 Visual Resources 3-50
3.5.1 Affected Environment 3-51
3.5.2 Environmental Consequences 3-55
3.6 Socioeconomics 3-58
3.6.1 Affected Environment 3-58
3.6.2 Environmental Consequences 3-60
3.7 Environmental Justice 3-61
3.7.1 Affected Environment 3-62
3.7.2 Environmental Consequences 3-63
3.8 Noise 3-64
3.8.1 Affected Environment 3-65
3.8.2 Environmental Consequences 3-65
3.9 Water Resources 3-66
3.9.1 Affected Environment 3-67
3.9.2 Environmental Consequences 3-67
3.10 Geology and Soils 3-70
3.10.1 Affected Environment 3-70
3.10.2 Environmental Consequences 3-71
3.11 Utilities 3-75
3.11.1 Affected Environment 3-75
3.11.2 Environmental Consequences 3-77
4 Cumulative Impacts 4-1
4.1 Definition of Cumulative Impacts 4-1

4.2 Past, Present, and Reasonably Foreseeable Actions 4-1
4.3 Cumulative Impact Analysis 4-5
4.3.1 Climate Change 4-5
4.3.2 Terrestrial Biological Resources 4-9
4.3.3 Cultural Resources 4-9
4.3.4 Recreation 4-9
4.3.5 Visual Resources 4-10
4.3.6 Socioeconomics 4-10
4.3.7 Environmental Justice 4-11
4.3.8 Noise 4-11
4.3.9 Water Resources 4-12
4.3.10 Geology and Soils 4-12
4.3.11 Utilities 4-12
Appendix A: 2020 Memorandum of Agreement A-1
Appendix B: Relevant Laws, Regulations, and Policies B-1
Appendix C: Public and Agency Participation C-1
Appendix D: National Historic Preservation Act Section 106 Consultation D-1
Appendix E: Endangered Species Act Section 7 Consultation E-1
Appendix F: Coastal Zone Management Act Coordination F-1
Appendix G: Cooperating Agencies Information G-1
Appendix H: References H-1
Appendix I: Distribution List I-1
Appendix J: List of Preparers and Contributors J-1

List of Figures

Figure 1-1 Project Area Location 1-3
Figure 2-1 Narrowing of Site Alternatives to the Focus Area 2-5
Figure 2-2 Focus Area with Biological Resource Survey Results 2-7
Figure 2-3 Notional Layout of Roadway Improvements, Utility Realignment, and Construction Laydown in Vicinity of Focus Area 2-8
Figure 2-4 Alternative 1 and 2 Notional Facility Layouts within the Focus Area 2-9
Figure 2-5 Proposed Access Road Improvements and Demolition/Site Preparation 2-11
Figure 3.2-1 Terrestrial Biological Resources in the ROI 3-7

Figure 3.2-2 Terrestrial Biological Resources in the ROI – West....3-11
Figure 3.2-3 Terrestrial Biological Resources in the ROI – Northwest....3-12
Figure 3.2-4 Terrestrial Biological Resources in the ROI – North....3-13
Figure 3.2-5 Terrestrial Biological Resources in the ROI – Northeast....3-14
Figure 3.2-6 Proposed Netted Areas within the Refuge....3-22
Figure 3.4-1 Recreational Resources in the Project Area....3-47
Figure 3.5-1 Key Observation Points....3-52
Figure 3.9-1 Water Resources in the ROI....3-68
Figure 3.10-1 Geological Features in the ROI....3-72
Figure 3.10-2 Soils in the ROI....3-73
Figure 3.11-1 Existing Utilities in the ROI....3-76
Figure 4-1 Locations of Past, Present, and Reasonably Foreseeable Actions....4-4

List of Tables

Table S-1 Summary of Potential Impacts....S-3
Table 2-1 Acreage Summary of Proposed Action Components....2-12
Table 2-2 Proposed Avoidance and Minimization Measures....2-14
Table 3.1-1 Total 36-Month Combined Construction GHG Emissions (metric tons)....3-3
Table 3.1-2 Equivalency Examples for Net Increase of Greenhouse Gas Emissions....3-3
Table 3.2-1 Vegetation Communities in the 2021 Survey Area....3-6
Table 3.2-2 ESA-Listed Species Known to or with Potential to Occur within the ROI....3-10
Table 3.2-3 Acreage Summary of Proposed Action Components....3-20
Table 3.2-4 Proposed Avoidance and Minimization Measures for Terrestrial Biological Resources....3-32
Table 3.3-1 Archaeological Sites within the Proposed Action APE....3-43
Table 3.4-1 Recreational Resources within the Refuge....3-46
Table 3.5-1 Visual Contrast Levels....3-56
Table 3.7-1 Demographic Indicators in the ROI....3-62
Table 3.8-1 Typical Noise Levels (dB Maximum Sound Level) at Various Distances from Construction and Demolition Equipment Operation....3-65
Table 3.9-1 Definition of Water Resources....3-66
Table 3.10-1 Definition of Geological Resources....3-70
Table 4-1 Past, Present, and Reasonably Foreseeable Actions....4-1

Table 4-2 Existing Climate Conditions on Guam 4-5

Table 4-3 Predictable Environmental Trends Associated with Climate Change Projected for Late Century 4-6

Table 4-4 Predictable Environmental Trends for Resources Associated with Climate Change 4-7

Abbreviations and Acronyms

A.D.	Anno Domini
AAFB	Andersen Air Force Base
APE	Area of Potential Effects
B.C.	Before Christ
BTS	Brown Tree Snake
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CNMI	Commonwealth of the Northern Mariana Islands
$C0_2e$	carbon dioxide equivalent
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
DNL	day-night average sound level
DoD	Department of Defense
DOI	Department of the Interior
DON	Department of the Navy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
GAR	Guam Administrative Rules
GHG	Greenhouse Gas
GPA	Guam Power Authority
GSHPO	Guam State Historic Preservation Officer
GWA	Guam Waterworks Authority
GWP	global warming potential
IPCC	Intergovernmental Panel on Climate Change
IT/COMM	Information Technology/ Communications
JRM	Joint Region Marianas
KOP	Key Observation Point
LFTRC	Live Fire Training Range Complex
LID	Low Impact Development
MCB	Marine Corps Base
MOA	Memorandum of Agreement
MOVES	Motor Vehicle Emission Simulator
MPMG	Multi-purpose Machine Gun
MSL	mean sea level
NAVFAC	Naval Facilities Engineering Systems Command
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NGLA	Northern Guam Lens Aquifer
NHPA	National Historic Preservation Act
N_2O	nitrous oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PCE	primary constituent element
ROD	Record of Decision
ROI	Region of Influence
SDZ	Surface Danger Zone
SEIS	Supplemental Environmental Impact Statement
SWPPP	Stormwater Pollution Prevention Plan
U.S.	United States
U.S.C.	United States Code
UFC	Unified Facilities Criteria
USCB	U.S. Census Bureau
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	unexploded ordnance
WWTP	Wastewater Treatment Plant

1 Purpose and Need for Proposed Action

This chapter introduces the proposed action and describes the project background and location, the purpose of and need for the action, the scope of the environmental analysis, relevant laws and regulations, and public and agency participation.

1.1 Introduction

The United States (U.S.) Marine Corps proposes to construct facilities and associated infrastructure for the U.S. Department of the Interior (DOI) (including the U.S. Fish and Wildlife Service [USFWS] and U.S. Geological Survey [USGS]) at the Ritidian Unit of the Guam National Wildlife Refuge (hereinafter called "the Refuge"). The proposed action also includes road improvements and development of an alternate public access route from the newly constructed facilities to publicly accessible areas within the Refuge, demolition of the existing DOI facilities, and preparation of the demolition area for potential habitat restoration and regeneration.

As described in more detail in Section 1.2, the proposed action is required because of decisions documented by the U.S. Department of the Navy (DON) in the 2010 Guam and Commonwealth of the Northern Mariana Islands (CNMI) Military Relocation Environmental Impact Statement (EIS), the associated Record of Decision (ROD), and its 2015 Supplemental EIS (SEIS) and ROD. The 2015 ROD identified a site on Andersen Air Force Base (AAFB) for a new live fire training range complex (LFTRC), which includes a Multi-purpose Machine Gun (MPMG) Range and four other adjacent rifle and pistol ranges to the east of the MPMG Range. When the MPMG Range is in use, the associated surface danger zone (SDZ) that overlays a portion of the Refuge (including the current DOI facilities) will be activated (Figure 1-1). In accordance with Marine Corps Order 3570.2J, an SDZ is an area associated with a training range that is designed to protect people during weapons training. When activated, the SDZ is an exclusion area that is strictly controlled to protect public safety. The 2015 National Defense Authorization Act (NDAA) (Public Law No. 113-291) authorized the establishment of the SDZ over a portion of the Refuge and empowered the Secretaries of the DOI and DON to enter into an agreement to establish and operate this SDZ over the Refuge. Pursuant to this authorization, in 2020 the DOI and DON signed a Memorandum of Agreement (MOA) (see Appendix A) that, among other commitments, required the DON to relocate the existing DOI facilities outside of the MPMG Range SDZ but still within the Refuge. In Section IV.I of the MOA, the Marine Corps estimated that the LFTRC (meaning any combination of the five component ranges and not necessarily any individual range) would be used up to 39 weeks/year and noted that additional scheduling information and timelines would not be available until the ranges became operational.

The Marine Corps prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) (42 U.S.C. sections 4321, et seq.), the Council on Environmental Quality (CEQ) implementing regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508), and Marine Corps Order 5090.2. Pursuant to 40 CFR Section 1501.5, this EA advances NEPA's purpose to inform decision-makers and the public about the construction of DOI facilities and the potential environmental effects of the proposed action.

The establishment and operation of a Marine Corps LFTRC, including the five separate ranges and their associated SDZs, were addressed in the 2015 SEIS and ROD and are not reevaluated in this EA. This EA addresses the effects of the proposed relocation of DOI facilities and related changes in public access.

There would be no changes to USFWS or USGS missions on the Refuge nor to LFTRC training operations analyzed in the 2015 SEIS.

1.2 Background

In 2010, to support the buildup of U.S. forces on Guam, the DON published an *EIS for the Guam and CNMI Military Relocation: Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing, and Army Air and Missile Defense Task Force*. The 2010 EIS evaluated the potential environmental impacts of the relocation of Marine Corps forces, including several alternative layouts and locations for a LFTRC, but deferred a siting decision on the LFTRC. In 2015, the DON published the Guam and CNMI Military Relocation (2012 Roadmap Adjustments) SEIS. The 2015 SEIS evaluated five LFTRC locations and the DON selected Alternative 5 in the ROD dated August 20, 2015. This 4,016-acre LFTRC alternative included a construction footprint of 315 acres, a 3,701-acre land and submerged land SDZ, and Special Use Airspace established in coordination with the Federal Aviation Administration. The 2015 ROD noted that "[a]lthough Alternative 5 would not require acquisition of non-federal land, access restrictions already established by the USFWS at the Ritidian Unit … would be adjusted to account for the establishment of the SDZs for the LFTRC" and the DON "would pursue an agreement with the USFWS in accordance with the provisions of Section 2822 of the Fiscal Year 2015 NDAA that would allow for the continued management of the Ritidian Unit" (ROD, pages 7-8). The 2015 ROD stated that "[a]ny decisions ensuring continued access to the Ritidian Unit … are dependent on the outcome of the negotiation [with DOI]" (ROD, page 8).

Section 2822 of the 2015 NDAA authorized the DON and DOI to enter into an agreement providing for the establishment and operation of an SDZ over the Refuge, and the relocation and reconstruction of impacted facilities within the Refuge. Pursuant to that authority, the DON and DOI negotiated the 2020 MOA. Section V.C.6 of the MOA requires the DON to "build [a] permanent replacement office, visitors' area, maintenance, research facilities, and any other facilities DON and DOI agree are commensurate with those impacted by the SDZs." Section V.C.6.c of the MOA further states: "In order to minimize adverse effects to designated critical habitat on the Refuge from construction of new permanent facilities, DON will demolish the existing DOI facilities, remove demolition debris, and prepare the site for restoration and regeneration." Section V.C.7 also requires the DON to identify and construct alternate access to the recreational portion of the Refuge outside the SDZ "to support continued public use consistent with the purposes of the Refuge and the LFTRC."

To support its mission, the DOI requires the relocated facilities be built within the Refuge (MOA Section IV(J)(a)). After the MOA was signed in May 2020, the DON and DOI worked collaboratively to identify requirements for the proposed new facilities and potential construction locations within the Refuge but outside of the SDZ. Both the DON and DOI would support implementation of the proposed action through compliance with all applicable laws and regulations relevant to the Federal Agencies' respective missions and roles regarding the proposed action.

1.3 Location

Figure 1-1 shows the general vicinity of the proposed project area, including the western portion of the Ritidian Unit outside of the SDZ, the location of the existing DOI facilities that would be replaced and removed, and areas subject to proposed road and utility improvements. The proposed action would also include avoidance and minimization measures (see Section 2.4), some of which would occur in the existing forest enhancement areas on MCB Camp Blaz.

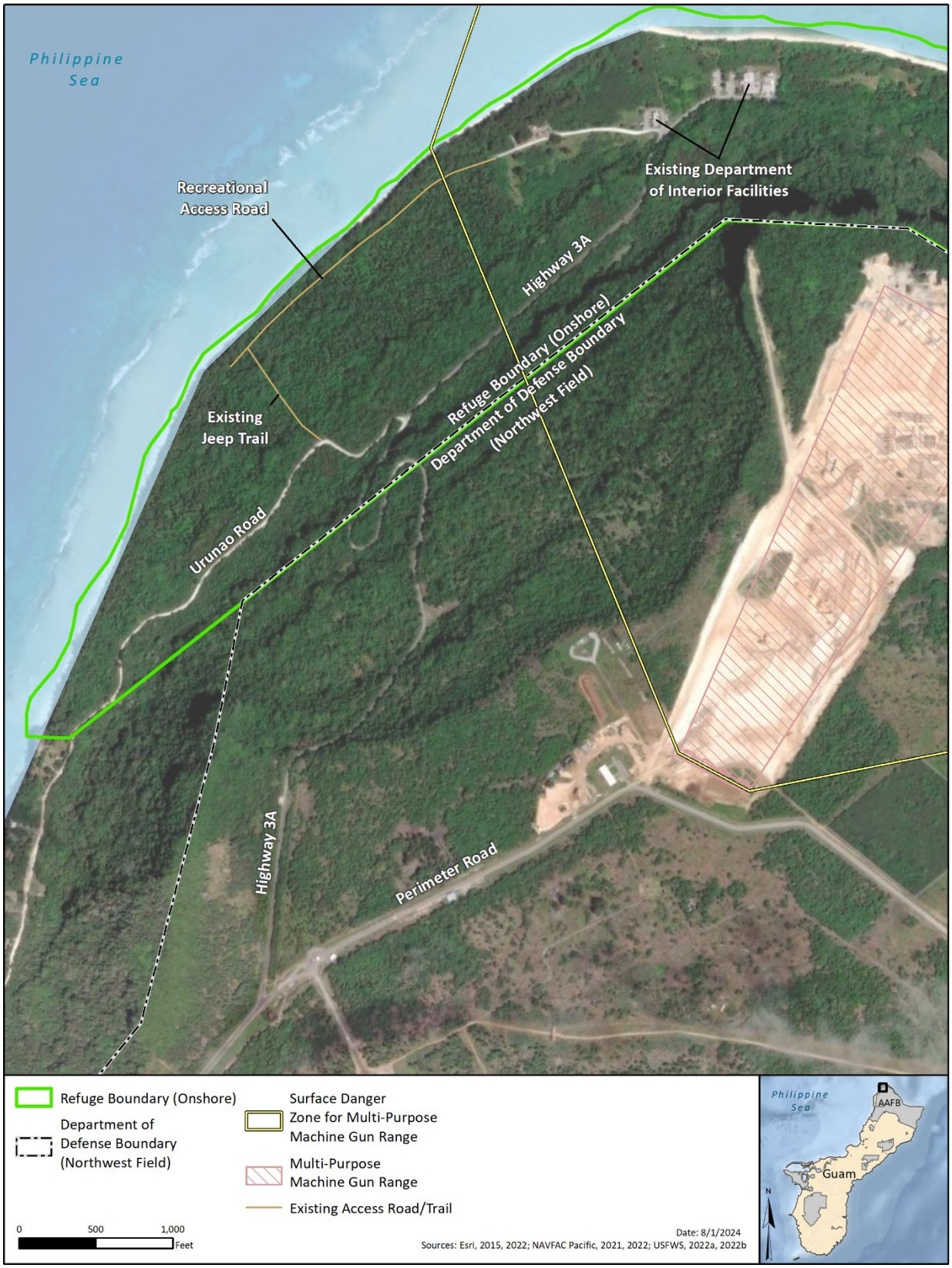


Figure 1-1 Project Area Location

The Ritidian Unit is one of three units of the Guam National Wildlife Refuge, which is a network of lands and waters on Guam set aside for the conservation, management, and restoration of fish, wildlife, and plant resources and their habitats. The Ritidian Unit is located on the northern tip of Guam and is the only unit affected by the proposed action. Throughout this EA all further references to "the Refuge" pertain only to the Ritidian Unit.

1.4 Purpose of and Need for the Proposed Action

The purpose of the proposed action is to provide DOI replacement facilities pursuant to Section 2822 of the 2015 NDAA and the 2020 MOA. The action is needed to enable:

- The USFWS to continue its management of the Refuge in accordance with the mission of the National Wildlife Refuge System and individual Refuge purposes, as outlined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd).
- The USGS to continue its Brown Tree Snake (BTS) Research and Rapid Response program under authority of Section 316 (*Comprehensive Program for the Eradication of the Brown Tree Snake Population from Military Facilities in Guam*) of the 2009 NDAA.
- The Marine Corps to train to meet its Title 10 readiness requirements.

1.5 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with the action alternatives and the No-Action Alternative described in Chapter 2. The environmental resource areas carried forward for full analysis and presented in separate subsections in Chapter 3 include terrestrial biological resources, cultural resources, recreation, visual resources, socioeconomics, environmental justice, noise, water resources, geology and soils, and utilities. As described in Section 3.1, potential impacts to the following additional resource areas would be negligible or nonexistent: air quality and greenhouse gas (GHG) emissions, hazardous materials and waste, marine biological resources, public health and safety, transportation, and land use.

1.6 Relevant Laws and Regulations

The Marine Corps prepared this EA based upon all relevant laws, statutes, regulations, and policies pertinent to the implementation of the proposed action (see Appendix B).

1.7 Public and Agency Participation and Intergovernmental Coordination

The Marine Corps is soliciting public and agency input regarding the proposed action through publication of this Draft EA. Appendix C describes the process followed for distribution of the Draft EA for public and agency participation, and the Final EA will include responses to comments. The Marine Corps will consider comments received during the public comment period prior to rendering a decision on the proposed action. The Final EA will provide a summary of public comments and responses to those comments, and any associated changes to the EA. All consultations and coordination with regulatory agencies listed below will be completed prior to the Final EA.

Joint Region Marianas (JRM) entered into a Programmatic Agreement (PA) with the Guam State Historic Preservation Officer (GSHPO) and other signatories in 2011 that applies to this proposed action. The PA establishes a process for the review and analysis of potential effects to historic properties and other cultural resources for all aspects of the Marine Corps relocation, including this relocation of DOI

facilities. In accordance with the PA, the Marine Corps is consulting with the GSHPO, interested parties, and the public regarding the proposed undertaking (see National Historic Preservation Act [NHPA] Section 106 consultation correspondence in Appendix D).

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA), the Marine Corps is conducting formal consultation with the Ecological Services Program of the USFWS regarding potential impacts to ESA-listed species and designated critical habitat (see ESA Section 7 consultation correspondence in Appendix E).

The Marine Corps is also preparing an effects test and determination under the Coastal Zone Management Act (CZMA) in accordance with local guidance (Guam Bureau of Statistics and Plans 2011). The Marine Corps will notify the Guam Bureau of Statistics and Plans, Coastal Management Program regarding its determination (see CZMA correspondence in Appendix F).

The USFWS Pacific Region accepted the Marine Corps' invitation to participate as a cooperating agency for this EA per 40 CFR Section 1508.1(g) (Appendix G).

This page intentionally left blank.

2 Proposed Action and Alternatives

This chapter describes the proposed action, alternatives development (including screening criteria, alternatives carried forward for analysis, and alternatives considered but not carried forward for analysis), and avoidance and minimization measures incorporated into the proposed action to avoid or reduce impacts.

2.1 Proposed Action

The proposed action is to construct new DOI facilities and associated infrastructure within the Refuge and outside of the Marine Corps' MPMG Range SDZ as described in the 2015 ROD and the 2020 MOA. The proposed action has three components:

1. Construct replacement DOI facilities and associated infrastructure.
2. Provide alternate public access from the new replacement facilities to the publicly accessible portions of the Refuge and other project-related road improvements.
3. Demolish the existing DOI facilities and prepare the site for potential habitat restoration and regeneration.

2.1.1 Construction of Replacement DOI Facilities and Associated Infrastructure

DON facility planners worked closely with DOI and Refuge staff to identify facility utilization, design, and infrastructure requirements for the proposed new DOI facilities, which reflect a balance of functional needs, consolidation of space requirements (relative to existing DOI facilities), efficiency and cost control factors, and environmental impact. This collaborative planning process yielded the following list of required construction projects and facility functions listed below:

Administration/Laboratories/Nature Center/Conference Room. These functions have a combined space requirement of approximately 14,000 square feet. The USGS Headquarters and Laboratory facility would include office and administrative spaces for onsite USGS staff and laboratory areas to support ongoing research related to the BTS and other species. The USFWS Headquarters and Nature Center would include administrative, classroom, storage, and research laboratory space for onsite USFWS staff and areas for public outreach and education. The nature center would include space for educational displays and a nature exhibit, a covered outdoor learning area, a multi-purpose classroom, and public restrooms. A shared conference/classroom facility would provide meeting and training space for USFWS and USGS staff and the public.

Maintenance Shop. This approximately 5,000-square-foot facility would provide storage and maintenance space for DOI equipment, vehicles, and other items. The shop would include four vehicle maintenance bays (one with a vehicle lift), storage areas, administrative office space, and a restroom with shower. Associated infrastructure would include an outside vehicle wash station and paved outdoor storage space for two shipping containers. Storage for corrosive and flammable materials would also be provided, either as a separate structure of approximately 150 square feet or combined with the Maintenance Shop.

Brown Tree Snake Enclosure. This new octagon shaped, open-air BTS research enclosure totaling approximately 4,300 square feet with smooth concrete walls 4.5 feet high would be similar to the existing BTS enclosure located at the current DOI facility.

Plant Nursery. A plant nursery totaling approximately 720 square feet would provide a shaded outdoor shelter for listed species plant propagation. It would consist of a concrete slab with a 3.5-foot-high perimeter wall and shade cloth spanning concrete columns and beams, as well as an adjacent workroom.

Parking. Requirements for paved parking include approximately 32 staff parking spaces, 30 visitor spaces, a drop-off zone and parking for at least two buses, and an additional unimproved parking area with room for approximately 100 vehicles.

Ancillary infrastructure within the new facility area would include courtyards, sidewalks, driveways, and internal roads; boundary fencing and gates; rock fall protection (as needed); separate enclosures for generators, fuel tanks, electrical and mechanical utility equipment, waste containers, etc.; and stormwater catchment/infiltration basins and other Low Impact Development (LID) measures. Site preparation prior to construction would include vegetation clearing, grading, and temporary erosion control.

Utility infrastructure would include electrical, water (potable, irrigation, and fire protection), wastewater, and information technology/communications systems. Mechanical utility infrastructure would include a water pump, storage tank and distribution network for fire response, potable water storage tank and distribution system, rainwater catchment tank, fuel storage tank, underground septic tank and leach field, oil/water separator, and stormwater drainage systems. Outside area lighting at the new facility site would be fully shielded to avoid impacts to sensitive species, meeting Unified Facilities Criteria (UFC) 3-530-01 ratings to reduce illumination of sensitive habitats within the Refuge. All drainage systems would be consistent with relevant stormwater pollution prevention plans (SWPPPs) and requirements.

All buildings would be constructed with reinforced concrete and all components such as exterior walls, flooring, foundations, windows, roofing, and utility systems would be designed to comply with Guam's seismic and environmental conditions, applicable UFCs, and USFWS space management requirements. The architectural design would be consistent with local and indigenous cultural influences and the unique climate characteristics of Guam, including roof overhangs that shade exterior walls and openings, light-colored walls that reflect solar radiation, and covered building entrances that provide shelter from the elements. Facilities would also comply with all applicable permits, DOI and USFWS criteria for facility security and cybersecurity, and any other applicable design and construction standards.

Following construction, the Marine Corps would transfer the new facilities to the USFWS, who would operate the facilities, continue to manage the Refuge, and be solely responsible for ongoing maintenance.

2.1.2 Alternate Access Route to Publicly Accessible Areas within the Refuge

In the 2020 MOA, the DOI and DON agreed that DOI would "provide public access to beaches, trails, and cultural properties during normal business hours consistent with the [Comprehensive Conservation Plan] and when the LFTRC is not being used…" and that the DON would "endeavor to provide the maximum practicable access" to the Refuge, "consistent with the accomplishment of training requirements…" (see Appendix A, sections V.B.7 and V.C.4).

To improve public access between the new DOI replacement facilities and the publicly accessible areas within the Refuge, the Marine Corps would identify and provide an alternate access route, including

improvements to existing roads and trails where needed. In the 2020 MOA, the DOI agreed to "[c]ollaborate and support DON efforts to identify, analyze, and implement alternative access to the [Refuge] recreational areas outside the SDZs to support continued public use and minimize access impacts" (see Appendix A, Section V.B.6). See Section 2.2.2 for a description of the proposed road improvements based on the proposed location of the DOI replacement facilities.

2.1.3 Demolition of Existing Facilities and Preparation of the Site for Potential Habitat Restoration and Regeneration

To minimize adverse effects to designated critical habitat from construction of the new facilities and following the completion of new construction and the relocation of DOI functions to the replacement facilities, the Marine Corps would demolish the existing facilities under the MPMG Range SDZ, except for the existing BTS enclosure, which would remain in place. Paved parking areas adjacent to the existing facilities would also be demolished; however, existing roads and unimproved parking areas would remain in place to be used when the MPMG Range is not active.

Existing below-ground utility lines such as sewer lines and leach field infrastructure would be abandoned in place following appropriate cutting, capping, and filling of lines according to standard procedures. The existing septic tank would be pumped, cleaned, removed, and replaced with approved fill material.

A site investigation would be conducted prior to demolition activities to determine if any hazardous materials are present in the existing buildings or in the surrounding soil that may require special handling. If materials such as lead and asbestos are discovered during the site investigation, such material shall be managed and removed in accordance with accepted industry practices and disposed of in accordance with applicable law. The removal of demolition debris would include establishing temporary stockpiles and staging areas within the existing disturbed area for processing of debris for potential reclamation of recyclable materials (such as scrap metal) and milling of excess rock, concrete, and asphalt.

Post-demolition preparation of the existing facility site would consist of clearing and grading of the ground surface and placement of topsoil. Following the Marine Corps' preparation of the site, the DOI would continue to manage the Refuge and habitat restoration and management would be the responsibility of the DOI.

2.1.4 Project Implementation

The proposed action would be implemented in a phased manner intended to limit potential disruptions to USFWS and USGS missions and functions within the Refuge.

- Phase 1 would include construction of the new facilities, associated infrastructure, and road improvements.
- Phase 2 would relocate USFWS and USGS to the new facilities, which is estimated to require approximately 6 months plus a 30-day activation period.
- Phase 3 would include the demolition of existing DOI facilities and preparation of the site for potential habitat restoration and regeneration of vegetation.

Construction of the proposed new facilities and associated infrastructure (including road improvements) would be completed, and DOI staff and equipment would be transitioned to the new facilities before demolition at the current DOI facility site (Phase 3) would begin. The three phases are projected to require approximately 36 months to complete, beginning in mid-2026 and concluding in mid-2029.

Construction would occur primarily during daytime hours; nighttime construction would be minimized to the greatest extent possible.

If Phase 1 or Phase 2 is not complete by the time the MPMG range is active, the Marine Corps would work with USFWS staff to schedule MPMG range operations for minimal interference with the Refuge. This "scheduling solution" would include no weekend operations and scheduling training on days the Refuge is closed (currently Mondays and Tuesdays). On days the MPMG range is active during construction, scheduling would also provide the USGS daily access to the existing facilities to conduct necessary mission related activities. These approaches offer solutions that would allow co-use of both facilities and minimize impacts to the public. In the event that proposed construction or unanticipated mission-critical training would require a temporary Refuge closure, USFWS would provide prior notice to the public via press release and notification on the Refuge's website and recorded phone message. If this "scheduling solution" is unable to resolve potential conflicts with USFWS and USGS staff, the DON would provide adequate temporary facilities. If existing facilities outside the Refuge or relocatable buildings on previously disturbed areas within the Refuge were not adequate, additional NEPA analysis may be required.

Phase 3 demolition and preparation of the site, and any associated access restrictions to the area within the SDZ during such activities, would be similarly coordinated between the DOI and DON to limit access impacts.

2.2 Alternatives Development

This section describes the Marine Corps' alternatives development process for construction of facilities and associated infrastructure and the provision of alternative access from the new replacement facilities to the recreational areas of the Refuge outside of the SDZ. Demolition and removal of debris at the existing DOI facilities and preparation of the demolished area are not subject to alternatives development because the location and process are fixed by the existing DOI facility site and the requirements of the MOA, Section V.C.6.c. This section of the EA first describes the alternatives criteria and development, followed by a description of the action alternatives carried forward for further analysis, and then the alternatives considered but not carried forward for analysis.

2.2.1 Alternatives Criteria

As described in Section 1.2, the 2020 MOA requires replacement DOI facilities to be located within the Refuge and outside the MPMG Range SDZ. To identify reasonable facility site alternatives within these requirements, the DON applied the following evaluation criteria:

1. *Avoid potential impacts to the Ritidian Archaeological Complex.* The Ritidian Archaeological Complex (shown in Figure 2-1) was excluded from consideration.
2. *Limit the extent of required construction.* A suitable facility location must be on reasonably flat terrain to limit subsurface disturbance and consist of at least 5–6 contiguous acres (the estimated footprint that would minimally satisfy facility use and space requirements).
3. *Prioritize sites that utilize existing roads, trails, and other previously disturbed areas.* Such areas are not considered critical habitat and would help reduce the area of new disturbance due to required construction.

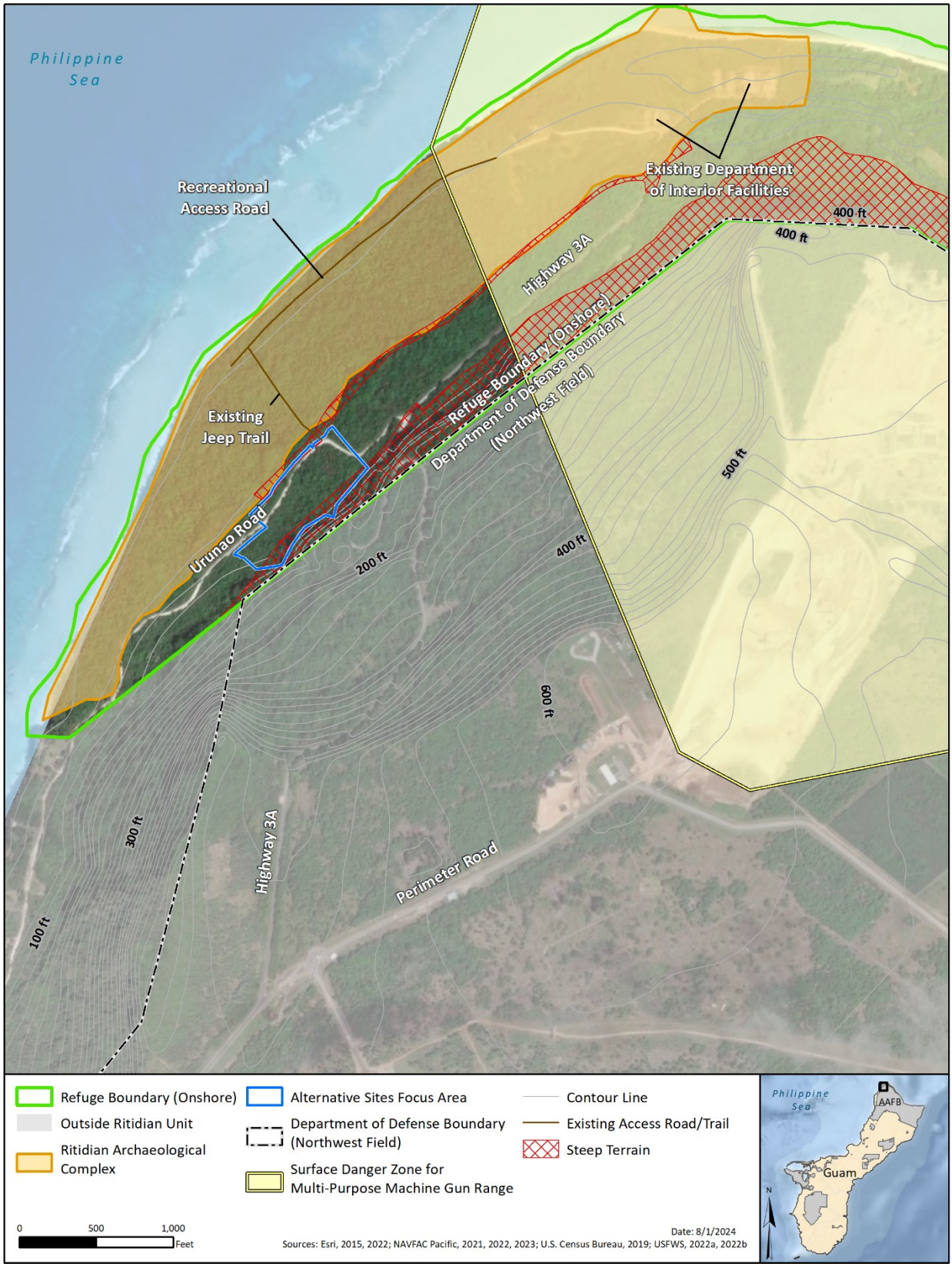


Figure 2-1 Narrowing of Site Alternatives to the Focus Area

4. *Limit potential impacts to sensitive biological resources.* While critical habitat within the available site selection area could not be avoided, the evaluation of potential replacement facility sites considered the locations of sensitive biological resources based on existing data and new biological surveys conducted for the proposed project.
5. *Limit potential impacts to sensitive cultural resources.* The evaluation of potential replacement facility sites considered the locations of sensitive cultural resources, based on existing data and new archaeological surveys conducted for the proposed project.

Applying the first two criteria above, DON planners identified an area of approximately 27 acres within the Refuge and outside the SDZ that could potentially include a site for the DOI facilities (see the unshaded area along Urunao Road shown in Figure 2-1). Within these 27 acres, the application of Criterion 3 narrowed this area to approximately 7.5 acres (the "focus area") that would make the best use of existing access roads. As shown with a blue line in Figure 2-1, this focus area is situated near the intersection of Urunao Road with Highway 3A, the primary access road to the Refuge. This site is also adjacent to an existing jeep trail that crosses the Ritidian Archaeological Complex to connect to a recreational access road along the coastline, which proceeds northeast across the SDZ boundary to the existing DOI facilities. With appropriate improvements, Jeep Trail Road and Recreational Access Road would provide alternate access between the replacement DOI facilities and recreational areas within the Refuge, including areas that would be accessible when the SDZ is not active.

Having narrowed the range of site alternatives for the DOI replacement facilities to the focus area, the Marine Corps conducted surveys for federally listed species and cultural resources within the parcel to support evaluation of Criteria 4 and 5. Figure 2-2 displays the results of the survey for biological resources in the focus area. The archaeological survey identified one site in one corner of the focus area that can be avoided but otherwise found no evidence of sensitive cultural resources.

Within the focus area, the Marine Corps developed two conceptual design alternatives for constructing the proposed facilities. Given that a detailed project design/layout has not yet been completed, the evaluation of impacts in Chapter 3 assumes the Alternatives could be implemented anywhere within the focus area. Figure 2-3 shows a notional layout of the proposed roadway improvements, utility realignment, and construction laydown area in the vicinity of the focus area, and Figure 2-4 shows a notional layout of the proposed new DOI facilities within the focus area. Under Alternative 1, the Marine Corps would construct the required DOI replacement facilities and infrastructure in a single-story configuration. Under Alternative 2, some of the required facilities would be consolidated in a two-story configuration. Regardless of the eventual siting and facility orientation within the focus area, both alternatives would be designed to avoid direct impacts to onsite biological and cultural resources as much as possible. The same access road improvements would apply to both alternatives.

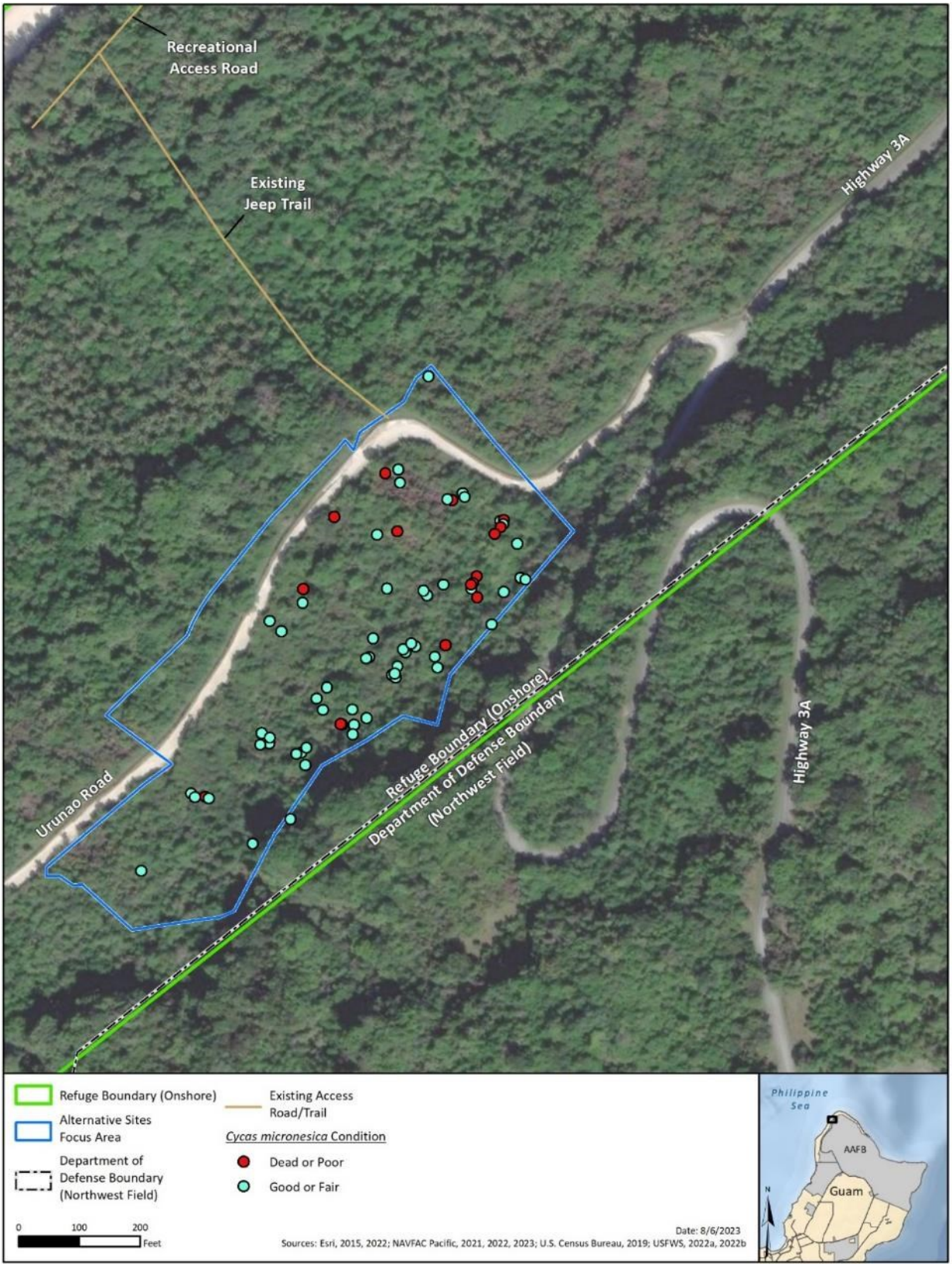


Figure 2-2 Focus Area with Biological Resource Survey Results



Figure 2-3 Notional Layout of Roadway Improvements, Utility Realignment, and Construction Laydown in Vicinity of Focus Area

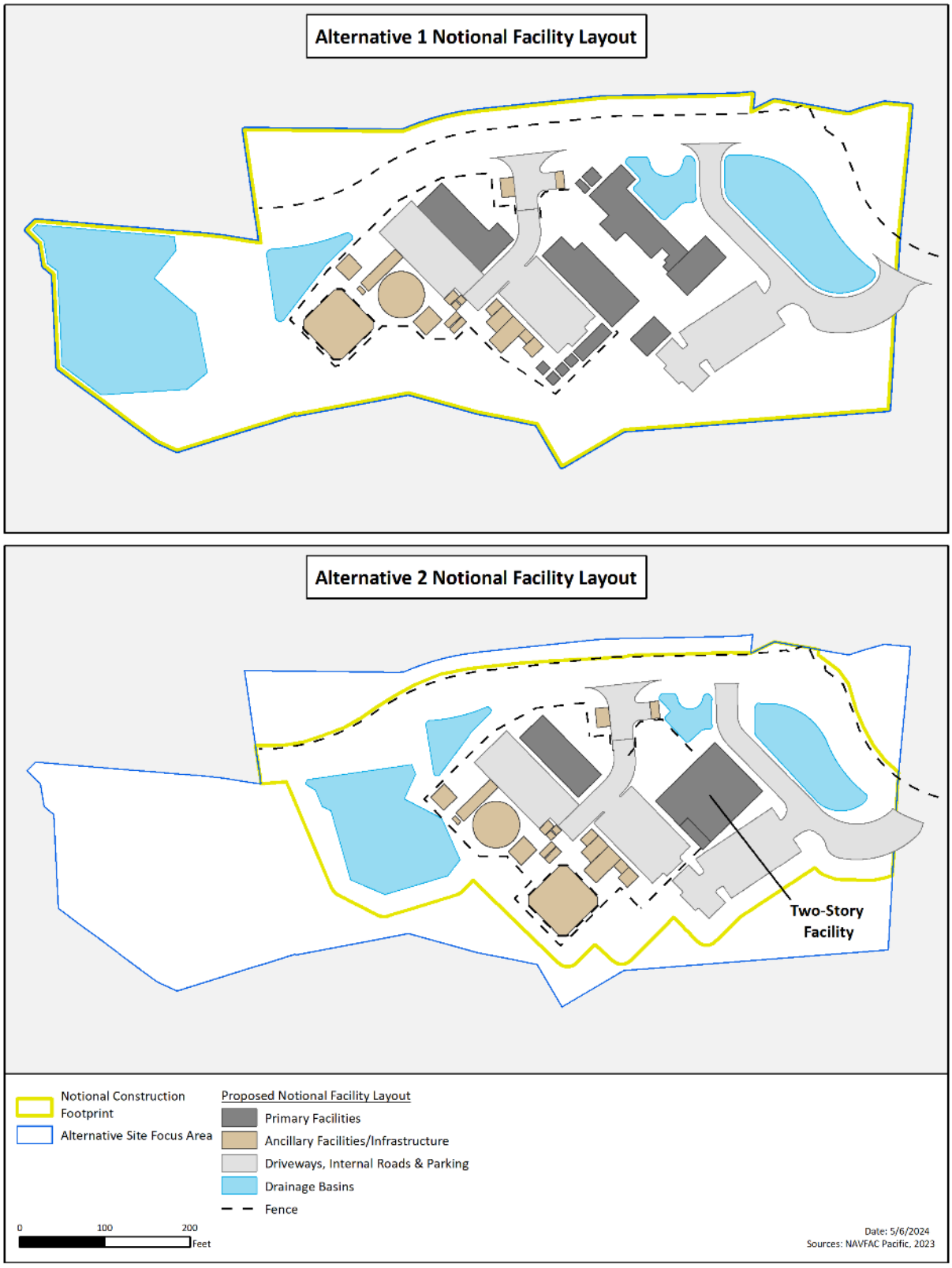


Figure 2-4 Alternative 1 and 2 Notional Facility Layouts within the Focus Area

2.2.2 Alternative 1

Under Alternative 1, the proposed new facilities identified in Section 2.1.1 would be developed as separate, single-story buildings in a campus-like configuration. Primary structures would include a combined USGS Headquarters and Laboratory facility, a combined USFWS Headquarters and Nature Center, a Maintenance Shop facility, and a BTS enclosure. Other smaller structures would include a shared Conference/Classroom facility, a plant nursery, individual animal labs, and various enclosures for utilities and other supporting infrastructure. Courtyards, walkways, driveways, and parking lots would be interspersed between and around the buildings to enhance circulation and create a campus atmosphere. Depending on the final project design, the construction footprint for Alternative 1 would potentially encompass the entire focus area. The notional facility layout for Alternative 1 shown in Figure 2-4 demonstrates one potential arrangement of the required facilities and infrastructure within the focus area, while providing flexibility in design and construction.

Regardless of the new facility layout within the focus area, Alternative 1 would also include the following road improvements (Figure 2-5):

- Highway 3A: Portions of this paved roadway or its unpaved shoulders would be excavated/repaved as needed to install underground utilities to connect the replacement facility site to existing utility networks outside the Refuge. The intersection of Highway 3A with Urunao Road would be reconfigured slightly and appropriate traffic control measures added. A new steel barrier gate would be installed on Highway 3A (see Figure 2-3) just past the intersection with Urunao Road to prevent vehicles from traveling further on Highway 3A when the MPMG Range is active and the SDZ is closed to public access.
- Urunao Road: A portion of this existing unimproved road would be realigned (see Figure 2-3) and paved to accommodate the proposed new facilities. Improvements to Urunao Road would be designed to accommodate two-way traffic on an asphalt surface, beginning at the intersection with Highway 3A and ending at the furthest vehicle access driveway into the replacement DOI facility campus. Beyond the DOI access point, the road would remain in its current unimproved state. Underground utility lines would be installed beneath the realigned/improved road to supply the DOI facilities. A new unimproved visitor parking area with spaces for approximately 100 vehicles would be cleared between the realigned Urunao Road and Highway 3A.
- Jeep Trail: The existing unimproved jeep trail would be widened and improved to a two-lane paved roadway from Urunao Road to the existing Recreational Access Road near the shoreline. Fencing and a gate would be installed at the intersection of the improved Jeep Trail Road with Urunao Road to prevent public access to the Refuge when it is closed (see Figures 2-3 and 2-5). At the beach end of the improved Jeep Trail Road, a paved turnaround would be constructed at the intersection with the Recreational Access Road. The improved Jeep Trail Road would also include a parallel concrete path and appropriate traffic control and safety measures to provide safe pedestrian access from the new facility campus to the Recreational Access Road, and the new turnaround would include areas for pick-up and drop-off of pedestrians, and accessible parking. The Jeep Trail Road would be constructed using concrete and asphalt pavements. Concrete pavement with special cured finishes would be added to provide slip-resistant traction for vehicles (and pedestrians on the parallel concrete path) traversing the steepest slopes of the roadway, while the remainder of the road would be asphalt, including the turnaround. Retaining walls would be constructed as determined necessary during project design. The paved road and turnaround would be designed to support fire and other emergency vehicle access.



Figure 2-5 Proposed Access Road Improvements and Demolition/Site Preparation

- Recreational Access Road: No excavation, widening, or paving would occur along this road, and improvements would be limited to filling any potholes to provide a level surface. A new steel barrier gate would be installed where this road crosses the SDZ to prevent access when the SDZ is active (see Figure 2-5).

In addition to DOI facility construction and the above road improvements, Alternative 1 would also include demolition of the existing DOI facilities and preparation of the demolition area for potential habitat restoration and regeneration as described in Section 2.1.3. Table 2-1 shows the acreage values for project components under Alternative 1. The total project footprint for Phase 1 of Alternative 1 (new facilities and infrastructure, utility realignments, and road improvements) would be 18.95 acres. Phase 3 (demolition and site preparation) would add 3.52 acres to the project footprint, for an overall total of 22.46 acres.

Table 2-1 Acreage Summary of Proposed Action Components

Proposed Action Component *(see Figure 2-5)*	***Alternative 1 (acres)***	***Alternative 2 (acres)***
Replacement Facilities (within Focus Area) – Phase 1	7.51	4.51
Road Improvements[1] – Phase 1	4.36	4.36
Utility Realignment – Phase 1	7.08	7.08
Phase 1 Subtotal	*18.95*	*15.95*
Demolition/Laydown Footprint – Phase 3	3.52	3.52
Demolition of Buildings, Walkways, and Parking Lots[2]	*1.42*	*1.42*
Totals	**22.46**	**19.46**

Notes: [1]From Figure 2-5, this component includes the polygons labeled "Road Improvements" and "Road Improvements, Utility Realignment, and Construction Laydown Area."

[2]These acres are a subset of the "Demolition Area with Laydown (Phase 3)" acreages and are not an additional value within the totals for each alternative.

Numbers may not add up due to rounding, and acres as shown in the table are composed of various land use types (e.g., structures, pavements, and vegetation) and are representative of polygons as shown in Figure 2-5.

2.2.3 Alternative 2

Alternative 2 would include all the project components identified in Section 2.1.1, with certain USFWS and USGS functions consolidated into a two-story building configuration. The notional layout for new DOI facilities under Alternative 2 (see Figure 2-4) is estimated to be approximately 4.5 acres and would potentially be situated at the northeast end of the focus area near the intersection of Urunao Road and the existing jeep trail. This notional layout demonstrates how the required facilities and infrastructure could potentially be arranged within the focus area, while providing flexibility in design and construction. To accommodate elevators and stairwells required of a 2-story structure, there would be less functional square footage for Refuge and USGS administration, operations, research, educational classrooms, and the nature center. Alternative 2 would include similar installation of utilities and other infrastructure as Alternative 1, the same demolition of existing DOI facilities and preparation of the site for potential habitat restoration, and the same road improvements. Table 2-1 presents a summary of acreage values for selected project components under both Alternative 1 and Alternative 2. For Alternative 2, the total project footprint for Phase 1 of the action (new facilities and infrastructure, utility realignments, and road improvements) would be 15.95 acres. Phase 3 (demolition and site preparation) would add 3.52 acres to the project footprint, for an overall total of 19.46 acres.

2.2.4 Alternatives Considered but Not Carried Forward for Further Analysis

The Marine Corps initially considered alternatives that would relocate DOI facilities outside the Refuge, thereby avoiding the need to impact critical habitat. However, because DOI mission requirements and MOA Section IV.J.a require the replacement facilities be located within the Refuge, alternative sites outside the Refuge were not carried forward for additional analysis.

Within the Refuge, the Marine Corps considered consolidating existing facilities into a smaller footprint in the existing disturbed location; however, this alternative would still leave the DOI facilities within the MPMG Range SDZ, contrary to Section IV.J.a of the MOA: "USFWS and USGS have noted they would be unable to meet the purposes of the [Refuge] and conduct the USGS BTS Research and Rapid Response without … the replacement of facility requirements at the [Refuge] to a location within the Refuge that is not within the SDZ …." As such, consolidation within existing disturbed locations was not carried forward for additional analysis.

The Marine Corps also considered other sites within the initial 27-acre area defined by the requirements to locate replacement facilities inside the Refuge and outside both the SDZ and the Ritidian Archaeological Complex (see Section 2.2.1). These sites were not carried forward for further analysis because they would be farther from existing roads, trails, and other already-disturbed areas and could be expected to result in additional disturbance of critical habitat and cultural resources.

Finally, the Marine Corps considered whether it would be possible to relocate the facilities and functions without any new construction; however, no facilities exist within the Refuge and outside the SDZ that could accommodate the DOI functions, so relocation without construction was not carried forward for analysis.

2.3 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur. The current DOI facilities would remain in place and the Refuge would be inaccessible to the public and DOI staff whenever the SDZ is activated for training operations at the MPMG Range. This would severely limit USFWS ability to meet the National Wildlife Refuge System mission and Guam National Wildlife Refuge purposes, as defined in the National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd). When the MPMG Range SDZ is active, the Refuge entry road would be closed and there would be no alternative public access to other publicly accessible portions of the Refuge outside the SDZ. The No-Action Alternative would also be inconsistent with the 2015 NDAA and the resulting MOA. The No-Action Alternative would not meet the purpose of and need for the proposed action; however, as required by NEPA, the No-Action Alternative is carried forward for analysis in this EA to provide a baseline for comparison of effects of the action alternatives.

2.4 Avoidance and Minimization Measures Included in the Proposed Action

Avoidance and minimization measures are policies, practices, and measures the Marine Corps would implement as part of the proposed action to proactively avoid or minimize potential environmental impacts. They are therefore distinguished from any mitigation measures identified during the NEPA environmental review process. Table 2-2 lists the avoidance and minimization measures that would be implemented as part of the proposed action. Proposed mitigation measures are discussed as appropriate in the individual resource sections in Chapter 3.

Table 2-2 Proposed Avoidance and Minimization Measures

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Adherence	General	DON would ensure that all activities occur as described in the proposed action.	All Project Components
Project Function Efficiency	General	DON would minimize impacts to listed species and critical habitat by consolidating functions to the maximum extent practicable in project design and development, while meeting the needs of the Refuge and USGS.	All Project Components
Lighting	Minimize bird/bat/turtle disorientation/ fallout and noise disturbance	Minimize nighttime lighting in demolition and construction sites. Outside area lighting would be fully shielded to avoid impacts to sensitive species, meeting UFC 3-530-01 ratings to reduce illumination of sensitive habitats within the Refuge. Minimize, to the maximum extent practicable, the use of all lighting so that light is not visible from the beach. Additionally, colors of lights used would be limited to wavelengths in the yellow, orange, and red spectrum with avoidance of blue and white lights.	Construction and Demolition
Construction Personnel Education	Minimize impacts to protected species	Prior to the start of construction, construction personnel working at the project site would be provided with information about general avoidance and minimization measures related to invasive species and biosecurity, and the listed species that may occur in the work areas. They would be required to attend a natural resources training program focused on federally listed species conducted by a qualified biologist.	Construction and Demolition
Pre-Construction Monitoring for ESA-listed Wildlife	Minimize potential impacts to ESA-listed wildlife species	The purpose of the pre-construction monitoring is to get an accurate count of the number of salvageable threatened or endangered species and to allow for collection of the threatened or endangered species for transplant (plants) or translocation (animals). A qualified biologist (see Appendix E.1 for qualifications) would conduct pre-construction/demolition visual surveys to determine if ESA-listed wildlife species are present at a project site prior to beginning work each day. The qualified biologist would also survey the construction and demolition project footprints and a 33-feet (10-meter) buffer prior to the start of construction or demolition activities to map the locations of all threatened and endangered species including home/host plant locations. Species-specific measures are as follows:	Construction and Demolition

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
		• Training for construction personnel to identify Mariana fruit bats and conduct visual observations of the project footprint at the start of each day. If Mariana fruit bats are observed prior to the start of work within 328 feet (100 meters), work would be postponed until the Mariana fruit bat has left the area of its own volition. If bat(s) enter the project footprint after the start of work, work would continue. • Vegetation to be trimmed or pruned would be inspected to confirm the plant does not contain tree snails. If a tree snail is found, it would be translocated away from the project footprint and into suitable habitat (USFWS 2017). • If any life stage of the Mariana eight spot butterfly (e.g., eggs, caterpillar, or chrysalis) is located within a project footprint during pre-construction surveys, it would be relocated onto an appropriate host plant (e.g., relocate pre-diapause larvae to *P. pedunculata* or *E. calcareum*) within similar sites away from the project footprint.	
Pre-Construction Monitoring for ESA-listed Plants	Minimize potential impacts to ESA-listed plant species	A qualified biologist would perform a pre-construction visual survey to identify any ESA-listed plant species within project sites prior to beginning vegetative clearing. Species-specific measures are as follows: • To the maximum extent practicable, healthy ESA-listed plants located within a project footprint requiring vegetative clearing would be transplanted into suitable protected areas or to a forest enhancement area at MCB Camp Blaz prior to clearing. The ability to salvage the plants would be dependent on the health of the plant and its likelihood of surviving transplantation. • Where ESA-listed plants do not need to be cleared and may not necessarily require transplanting, the qualified biologist would identify listed plant species to aid personnel in identification and avoidance (e.g., both clusters of *T. rotensis*).	Construction and Demolition
Pre-Construction Monitoring for Host Plants – Mariana eight-spot butterfly	Minimize habitat loss for Mariana eight-spot butterfly	During pre-construction visual surveys within project sites prior to beginning vegetative clearing, a qualified biologist would identify host plant species (*P. pedunculata* and *E. calcareum)* for the Mariana eight-spot butterfly with flagging attached to adjacent non-listed plants to aid personnel in identification and avoidance or would salvage and translocate the host plants to the maximum extent practicable.	Construction

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Snail Habitat Protection	Minimize impacts on Guam tree snails	• A qualified biologist would coordinate with the construction crews to ensure any observed Guam tree snails are avoided or are translocated prior to work commencing. • A qualified biologist would inspect vegetation to be removed to confirm the plant does not contain a Guam tree snail. If a snail is found, the snail(s) would be collected by a qualified biologist with experience handling tree snails and translocated to a suitable site on the Refuge. The DON would coordinate with the Refuge in advance to identify potential snail translocation site(s). • DON would conduct surveys of potential translocation sites. Tree snails may be relocated to more than one site after considering the total number of tree snails to be translocated, potential for human disturbance, flatworm presence, home tree abundance, and general canopy cover.	Construction
Use of Native Plants in Landscaping	Avoid introduction of non-native and invasive species	• Appropriate native and non-invasive species would be planted in all new landscapes upon completion of proposed construction activities. Plants to be used would be selected from a list of recommended and approved plants in accordance with relevant guidelines.	Construction and Site Preparation
Cycad Transplanting	Minimize loss of healthy *C. micronesica* individuals	• As the construction designs are finalized, the number of salvageable *C. micronesica* would be determined by the qualified biologist. This "x" number would be used to determine the number of plants needed to offset the impacts of the action. • Design of the facility and road/utility realignments would avoid locations of the known trees to the extent practicable; however, where trees must be removed, individual healthy trees would be transplanted into an undisturbed area within the Refuge. • If a *C. micronesica* plant is located within a project footprint during pre-construction surveys, the plant would be evaluated to determine if the plant or parts of the plant are healthy and suitable for salvage and transplantation. A plant must be considered "salvageable" to be suitable for salvage and transplantation. A qualified biologist would make the determination of the plant health using the Health Assessment Criteria Worksheet (Appendix E.1).	Construction and Site Preparation

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
		• Salvage of plant material for cycads would be dependent on salvage work method feasibility (e.g., safety and site-specific conditions) and sufficient plant health to support transplantation survival. • Whole plants would only be transplanted once they have been determined to be healthy and suitable for transplant within the fenced, ungulate-free forest enhancement areas on MCB Camp Blaz. • The DON may collect seeds or cuttings from healthy plants that would be cleared or impacted as part of the construction activities in order to propagate in a nursery and transplant within the forest enhancement areas on MCB Camp Blaz. • Seeds and cuttings may be collected from individuals outside the project footprint, but within the Refuge; however, no more than ten percent of any individual plant's seeds would be collected. • During transplant, to the maximum extent possible, propagated plants from the same genetically unique individual (i.e., a stem and pup from the same parent tree) would be planted the maximum distance apart allowed by the planting arrangement. • After transplanting the *C. micronesica* would be subject to an annual treatment with a slow release imidacloprid insecticide to treat cycad *Aulacaspis* scale for a duration of five years. • After transplanting, 12 months of maintenance would be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species would be removed within a 20-foot (6-meter) radius around transplants. • Transplanted *C. micronesica* would be considered living/surviving when they show: full crown development, no visible sign of nutrient deficiencies, and no visible sign of stem rot/decay. Photographs would be taken annually to document full crown development, lack of nutrient deficiencies and no visible signs of stem rot/decay. To maintain the number of cycads that would be expected to occur 20 years from the start of vegetation clearing, the project would salvage or propagate a sufficient number of cycads based on a 5.8% annual rate of decline.	

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
		• Monitoring would continue until the transplants meet the survival criteria. Maintenance would be reduced and eliminated during a hardening-off period and then the plants would be monitored for at least 6 months following cessation of maintenance activities. Following completion of the survival criteria monitoring period, intermittent monitoring would occur as part of INRMP implementation at 5, 10, 15, 19, and 20 years following transplanting. • Identification tags would accompany transplanted *C. micronesica* as well as GPS submeter coordinates for the *C. micronesica* locations during the 20-year monitoring period.	
Plant Habitat Protection	Minimize loss of *D. guamense*	There is some uncertainty regarding the final project footprint and whether the one *D. guamense* within the area proposed for utility realignment would be permanently removed as a result of the action. • If a *D. guamense* plant is located within a project footprint during pre-construction surveys, the plant would be evaluated to determine if the plant is healthy and suitable for salvage and transplantation. A plant must be in good or fair condition to be suitable for salvage and transplantation. A qualified biologist would make the determination of the plant's health. • Salvage of plant material for *D. guamense* would be dependent on salvage work method feasibility (e.g., safety and site-specific conditions) and sufficient plant health to support transplantation survival. • If the whole plant cannot be salvaged DON may collect seeds from healthy plants in the project footprint or within the MCB Camp Blaz forest enhancement areas to propagate and transplant within the forest enhancement areas. The forest enhancement areas are fenced and have had ungulates removed. Any such seed collection or cuttings outside the project footprint would entail collection of no more than ten percent of any individual plant's seeds. • Identification tags would accompany transplanted *D. guamense* as well as GPS submeter coordinates for the *D. guamense* locations.	Construction

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
		• After transplanting, up to 12 months of maintenance would be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species would be removed within a 20-foot (6-meter) radius around transplants. • Monitoring will continue until the transplants meet the establishment criteria described below. Maintenance would be reduced and eliminated during a hardening-off period and then the plants would be monitored for at least 6 months following cessation of maintenance activities. • Plants would be monitored until they are considered established. • Transplanted *D. guamense* would be considered established when they flower and set seed and there are no visible signs of nutrient deficiencies. • Following completion of the establishment period, intermittent monitoring would occur as part of INRMP implementation at 5 and 10 years following transplanting.	
Plant Habitat Protection	Minimize loss of *S. nelsonii*	No disturbance from construction, demolition, or site preparation would occur within the immediate vicinity of these plant species.	Construction
Plant Habitat Protection	Minimize loss of *T. rotensis*	There is some uncertainty regarding the final project footprint and whether or not the two populations (23 individuals) of *T. rotensis* within the utility realignment along Highway 3A would be permanently removed as a result of the action. No direct impacts to *T. rotensis* are anticipated. If a *T. rotensis* is located within a project footprint during pre-construction surveys, the plant would be evaluated to determine if the plant or parts of the plant are healthy and suitable for salvage and transplantation. A qualified biologist would make the determination of the plant's health. • Salvage of plant material for *T. rotensis* would be dependent on salvage work method feasibility (e.g., safety and site-specific conditions) and sufficient plant health to support transplantation survival. • The preferred method of plant propagation is seed collection and cuttings. Seeds and cuttings collected for this propagation activity would come from wild plants growing within the construction footprint (if available); any such seed and cutting collection outside the construction footprint would entail collection of no more than ten percent of any individual plant's seeds or plant parts.	Construction

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
		• The number of plants that are replaced would be equal to or greater than the number that are directly impacted. The transplant location is dependent on the location of the plant. If the impacted plant is on DoD property, it would be transplanted to MCB Camp Blaz. If the impacted plant is on the Refuge, it would be transplanted on the Refuge. Transplants would be planted either within the forest enhancement areas on MCB Camp Blaz (approximately 19 plants) or the Refuge (approximately four plants). • Identification tags would accompany transplanted *T. rotensis* as well as GPS submeter coordinates for the *T. rotensis* locations. • After transplanting, up to 12 months of maintenance would be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species would be removed within a 20-foot (6-meter) radius around transplants. • Monitoring would continue until the transplants meet the establishment criteria described below. Maintenance would be reduced and eliminated during a hardening-off period and then the plants would be monitored for at least 6 months following cessation of maintenance activities. • Plants would be monitored until they are considered established. • Transplanted *T. rotensis* would be considered established when they show full crown development and show no visible sign of nutrient deficiencies. Photographs would be taken annually to document full crown development, reproductive structures, and lack of nutrient deficiencies. • Following completion of the establishment period, intermittent monitoring would occur as part of INRMP implementation at 5 and 10 years following transplanting.	

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Critical Habitat Protection	Minimize impacts to critical habitat	• DON would demolish the existing DOI facilities, remove demolition debris, and prepare the site for potential habitat restoration and regeneration. The demolition of the existing DOI facilities would leave 1.42 acres of cleared area for potential habitat restoration and regeneration. • The DON would fund the Refuge to undertake the collection and outplanting of identified and prioritized plant species used for foraging, rearing, roosting, sheltering and nesting by the Mariana fruit bat, Mariana crow and Guam kingfisher to several focal areas (including the demolition area, if suitable after demolition) and across the Refuge where appropriate. This measure would minimize the construction impacts on critical habitat by providing protection from ungulates and enhancement of critical habitat in areas already demonstrating the appropriate substrate and microclimate to support outplantings. • DON would fund the Refuge to collect plant material, propagate, outplant and maintain these specific plant species for the benefit of the Mariana fruit bat, Mariana crow, and Guam kingfisher in areas selected by the Refuge. • The Refuge would target the outplanting and maintaining of sufficient plants to ensure that 488 genetically unique individuals of 15 different identified and prioritized native species would achieve fruiting twice. • Five areas would be netted to exclude ungulates for conservation benefit. The management actions within the netted areas would vary based on current habitat quality, substrate and access. • This conservation measure is a “turnkey” measure such that once DON has completed demolition area preparation and provided the agreed-upon funding for the measure, habitat management would be the responsibility of the Refuge. This means the Refuge would be responsible for implementation, compliance, and success of conservation measures associated with critical habitat as part of its on-going conservation management of the Refuge. All monitoring reports for this conservation measure would be prepared by the Refuge and provided to DON for submission to USFWS Ecological Services in accordance with the Biological Opinion.	Demolition and Site Preparation
Plant Protection	Minimize loss of protected species	Any plant material collected on the Refuge for the purposes of propagation outside of the construction footprint must be coordinated with and approved by Refuge.	All Project Components

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Biosecurity	Minimize introduction of non-native species to Guam or inadvertent spread to other locations from Guam	Develop a HACCP Plan, which would identify risks and potential pathways for non-native species and would outline procedures for controlling and removing risks identified. The plan would require inspections and proper re-use or disposal of vegetation to avoid contributing to the further spread of non-native species.	Construction and Site Preparation
Erosion Control Plan	Biological resources and water resources effects	Prepare an Erosion Control Plan and comply with all required clearing, grading, and stockpiling permits issued by Guam Environmental Protection Agency for facility construction, utility realignments, and demolition.	Construction
Erosion Control	Biological resources and water resources effects	Reduce the potential for soil, sediment, and pollutants to be transported off site through use of erosion socks, runoff detention basins, silt fencing, and drainage features (e.g., prevent ponding, divert direct stormwater flow away from construction sites, etc.).	Construction
Stormwater Control	Avoid increased water on beaches to reduce impact on Green turtles	No new or existing increases of any concentrated flow. Permanent stormwater design features for this project would be designed per the 2006 CNMI and Guam Stormwater Manual. The NPDES Program Comprehensive Construction Storm Water Pollution Prevention Plan (Comprehensive SWPPP) for the Guam Military Relocation DPRI Construction Program dated Nov 2014 is a guidance document intended to aid construction contractors as they prepare the project-specific SWPPP.	Construction
Dust Suppression	Air emissions particulates, biological resources	Conduct regular watering during ground-disturbing construction activities to reduce negative impacts from airborne particles during construction.	Construction
Avoidance of Sinkholes	Geology and soils impacts	For any sinkholes/depressions discovered before or during construction, the project would comply with 22 GAR Chapter 10 Section 10107f, which prohibits earth-moving within sinkholes or within a 30-foot (9-meter) buffer of a sinkhole that threaten their viability, function, or the conveyance of surface water into such features. Guam Environmental Protection Agency must authorize modification to or use of sinkholes and must include an assessment to ensure that adverse effects to sinkholes do not occur.	Construction
Low Impact Development	Minimize erosion, runoff, and sedimentation	Revegetate using native and non-invasive plants; use permeable surfaces; install vegetated swales, level spreaders, sediment basins/traps, erosion control blankets, and stormwater retention/detention ponds; and implement infiltration and filtering practices.	Construction
Roadway Design	Minimize erosion, runoff, and sedimentation	Use open vegetated channels, bioretention areas, and infiltration and filtering practices.	Construction

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Traffic Management	Minimize traffic delays during construction	Implement standard construction traffic protocols.	Construction
Minimize Vibration	Minimize impacts to caves and rock shelters	Implement construction methods and monitoring of earthmoving equipment to limit vibration.	Construction
Maximize Green Waste Reuse	Reduces volume of project-derived waste (e.g., construction and demolition debris and green waste) that would otherwise be disposed of at permitted disposal facilities	Process green waste on-site for reuse (goal of 100%) during construction. Meet 60% diversion rate goal for construction/demolition debris through reuse (including such actions as concrete crushing and reuse as base material and grinding and reuse of asphaltic concrete from roads). Meet goal of 50% diversion rate from disposal for project non-construction/demolition solid waste (not directly generated from materials used for erecting structures).	Construction
Protection of Cultural Resources/ Historic Properties	Avoid impacts to cultural resources	Provide cultural resources training to construction personnel.	Construction and Demolition
Protection of Cultural Resources/ Historic Properties	Avoid impacts to inadvertent discoveries of cultural deposits or human skeletal remains	As noted in Stipulation VI.F of the 2011 PA, a DON archaeologist would provide site checks, oversee coordination and execution of the archaeological mitigation measures, and provide quality control. If any human remains are discovered, work would immediately cease and the Standard Operating Procedure Regarding the Inadvertent Discovery of Human Remains on Guam, specified in Appendix G as noted in Stipulation IX.B of the 2011 PA would be followed.	Construction and Demolition
Facility Design and Avoidance of New Cultural Resource	Avoids adverse effects to newly recorded archaeological site "Temp Site 1" identified in 2022 survey	Design new facilities to avoid impacting "Temp Site 1" and mark the site location to avoid ground disturbance during construction.	Design and Construction

Legend: % = percent; CNMI = Commonwealth of the Northern Mariana Islands; DoD = Department of Defense; DON = Department of the Navy; DPRI = Defense Policy Review Initiative; ESA = Endangered Species Act; GAR = Guam Administrative Rules; GPS = Global Positioning System; HACCP = Hazard Analysis and Critical Control Point; INRMP = Integrated Natural Resources Management Plan; MCB = Marine Corps Base; NPDES = National Pollutant Discharge Elimination System; PA = Programmatic Agreement; SWPPP = Stormwater Pollution Prevention Plan; UFC = Unified Facilities Criteria; USFWS = United States Fish and Wildlife Service; USGS = United States Geological Survey.

This page intentionally left blank.

3 Affected Environment and Environmental Consequences

This chapter presents a description of the affected environment in the project area and an evaluation of the potential direct and indirect effects of the proposed action and alternatives on specific environmental resources. Cumulative effects of past, present, and reasonably foreseeable future actions are discussed in Chapter 4.

In May 2023, after data collection and site surveys for this EA had been completed, Typhoon Mawar passed over Guam, reaching Category 4-level winds and causing considerable damage within and around the Refuge, primarily to vegetation and other terrestrial biological resources. The typhoon did not substantially change the affected environment for other environmental resources described in this EA. Typhoons are a common meteorological occurrence for Guam. In the 50 years between 1970 and 2019, Guam experienced a total of 49 typhoons, 12 of which were considered major (King et al. 2020). The timing of the proposed action assessed in this EA (between approximately 2026 and 2029) would allow between three to six years for post-typhoon recovery. Accordingly, the descriptions of the affected environment for all but two of the resources described in this chapter are based on pre-typhoon conditions (Section 3.2, *Terrestrial Biological Resources*, includes one additional survey from 2024; Section 3.5, *Visual Resources*, includes photos taken one year after Typhoon Mawar). Section 3.2, *Terrestrial Biological Resources*, discusses in more detail the effects of Typhoon Mawar on affected species.

The introduction of each resource section in this chapter defines the region of influence (ROI) for that resource. The acreage values estimated for various components of the project area and referenced in the affected environment descriptions and impact analyses in this chapter are defined in Table E-1 of Appendix E.2.

3.1 Scope of Analysis

As noted in Section 1.1, this EA does not revisit or reevaluate the potential impacts identified in the 2015 SEIS and ROD associated with the establishment and operation of the MPMG Range and its associated SDZ. This EA analyzes the impacts of the replacement DOI facility, the associated road improvements and public access changes, and the demolition and site preparation for potential habitat restoration and regeneration at the existing facility location. There would be no changes to USFWS or USGS missions on the Refuge.

Environmental resources carried forward for analysis in this chapter include terrestrial biological resources, cultural resources, recreation, visual resources, socioeconomics, environmental justice, noise, water resources, geology and soils, and utilities. As described below, potential impacts to the following resources would be negligible or nonexistent and these resources are not evaluated further in this EA.

Air Quality and GHG Emissions: According to the current U.S. Environmental Protection Agency (USEPA) designation, Guam is in attainment for all National Ambient Air Quality Standards established for criteria pollutants except for the areas immediately around the Cabras and Tanguisson power plants that are in nonattainment for sulfur dioxide (USEPA 2022). The proposed action is in an area that is in attainment for all criteria pollutants. Construction activities associated with the proposed action in this EA would be similar in type and location to the proposed demolition and construction of replacement facilities outside of the SDZ analyzed in the 2015 Final SEIS, which concluded the proposed construction would result in short-term, intermittent air quality impacts within and beyond the project area, but emissions

would be below de minimis threshold levels for prevention of significant deterioration and, thus, would not affect the attainment status of the project location. All construction activities would comply with Guam Environmental Protection Agency air quality laws and regulations and Guam air quality implementation plans. Dust management avoidance and minimization measures such as application of water would be implemented (Guam Environmental Protection Agency Title 22, Division 1, Chapter 1, Guam Air Pollution Control Regulations).

Climate change results from the incremental addition of greenhouse gas (GHG) emissions from millions of individual sources. Each GHG is assigned a global warming potential (GWP). GWP is an index that incorporates both the direct effects of a gas on radiation—its "radiative efficiency"—as well as how long the gas persists in the atmosphere, or its "lifetime," and reflects the ability of a gas or aerosol to trap heat in the atmosphere. The GWP rating system is standardized to CO_2, which has a value of one. The equivalent CO_2 rate is calculated by multiplying the emissions of each GHG such as methane (CH_4), nitrous oxides (N_2O), etc., by its global warming potential and adding the results together to produce a single, combined emissions rate representing all GHGs and reported as CO_2 equivalents or CO_2e.

On January 9, 2023, the CEQ published interim NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change. This interim guidance explains how agencies should apply NEPA principles and existing best practices to their climate change analyses and has been incorporated into this EA. Although the 2015 SEIS GHG emissions analysis for the LFTRC (which included the DOI facility replacement action) accounted for short-term emissions during construction, per the CEQ interim guidance GHG emissions associated with the update of construction activities under the proposed action are calculated for on-road and non-road construction equipment and vehicles. Construction would take place in various phases over a 36-month period starting from 2026.

Construction crew and equipment requirements and productivity anticipated from construction activities and scale as described in Chapter 2 were assessed using methods and data provided in the Facilities Construction Cost Data handbook. GHG emissions are estimated based on these estimated operational hours from various types of nonroad equipment and vehicle trips multiplied by their respective GHG emission factors. GHG emission factors were derived from the use of the most recent USEPA Motor Vehicle Emission Simulator (MOVES) Version 4.0 emission factor model (USEPA 2023), which is associated with the national default model database for both non-road equipment and on-road vehicle engines. Because the MOVES model does not contain data for Guam, the database for the US Virgin Islands was used, based on a recommendation from the USEPA (USEPA 2013a). This database was selected due to the similar remote nature of the U.S. Virgin Islands compared to the island of Guam. Selecting model input parameters available for a similar remote island for Guam is considered reasonable, as standard control measures or population data inputs are limited compared to most states.

The results of estimated GHG emission calculations for the proposed action are summarized in Table 3.1-1. The amount of total construction GHG emissions is approximately 0.002% of the U.S. Territories inventory. The effects of climate change are experienced locally and regionally but are not the direct result of a single action's GHG emissions. This is because climate change is a result of the global aggregation and mixing of GHGs from all sources. Each local or regional GHG emission source makes a small contribution to the global atmospheric concentration of GHGs. Therefore, while the proposed action would cause a slight and temporary increase in GHG emissions on a local level, its overall small contribution to global GHG concentrations affecting climate change would not cause any discernible climate change effects.

The CEQ interim guidance also states that agencies may provide accessible comparisons or equivalents to help the public and decision makers understand GHG emissions in more familiar terms, such as contextualizing GHG emissions in terms of annual household emissions, average emissions from a certain number of vehicles on the road, or quantity of fuel burned. As shown in Table 3.1-1, the proposed construction activities would cause a potential increase of 704 metric tons of GHG emissions. Equivalency values based on these one-time emissions are summarized in Table 3.1-2. See Chapter 4, *Cumulative Impacts*, for discussion of predictable environmental trends associated with climate change.

Table 3.1-1 Total 36-Month Combined Construction GHG Emissions (metric tons)

Source	*CO_2*	*CH_4*	*N_20*	*$C0_2e$*
On-road Vehicle	79	0.017	0.013	84
Non-road Equipment	619	0.002	0.001	619
Total	698	0.019	0.014	704
2021 US Territories GHG Inventory[1]				33,305,000
Percentage of 2021 US Territories GHG Inventory				0.002%

Note: [1] 1 U.S. Territories (American Samoa, Guam, Hawaii, Northern Marianas Islands, US Virgin Islands, and Puerto Rico) are included in U.S. National Greenhouse Gas Inventory.

Legend: CH_4= methane; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; N_2O = nitrous oxides.

Table 3.1-2 Equivalency Examples for Net Increase of Greenhouse Gas Emissions

Emission Source	*Equivalency to 704 Metric Tons of CO_2e Increase*
Barrels of crude oil consumed	1,630
Gasoline powered passenger vehicles driven for one year	168
Tanker truck's worth of gasoline	9.3
Homes' energy use for one year	91.8
Homes' electricity use for one year	139

Legend: CO_2e = carbon dioxide equivalent.

Source: USEPA 2024.

Hazardous Materials and Waste: Construction and demolition activities would result in a short-term increase in the use of hazardous materials that would cease at the completion of construction activity. The hazardous materials to be used are common to construction and demolition and include such items as fuel and lubricants for the construction equipment, and paints and solvents. All hazardous materials (e.g., asbestos, lead-based paint, etc.) would be handled and disposed of per applicable regulations for construction and demolition projects on Guam. Considering the limited extent, duration, and general nature of the proposed construction and demolition activities, and the well-established procedures for safe handling and disposal of construction materials and demolition debris, impacts resulting from hazardous materials and waste would be negligible and are not evaluated further in this EA.

Marine Biological Resources: No in-water construction work would occur under the proposed action so there would be no direct impacts to marine resources from construction activities. In addition, since all proposed construction activities would be conducted in compliance with the USEPA NPDES Construction General Permit and utilize appropriate avoidance and minimization measures, such as runoff detention basins and silt fencing, to reduce the potential for soil, sediment, and pollutants to be transported off site, there would be negligible or no indirect impacts to marine resources from stormwater runoff or sediment reaching coastal waters during the proposed construction (see Table 2-1). There would also be

negligible or no impacts to marine biological resources from noise. Impact activities such as jack hammering could result in sound pressure (vibrations) in the nearby water; however, these vibrations are not known to cause disruptions to marine wildlife and typically do not occur beyond 200 feet from the shoreline (Caltrans 2020). The new facility construction and the facilities proposed for demolition, which may require impact activities, are both further than 200 feet from the shoreline. Airborne noise originating onshore is not anticipated to have any underwater effect, particularly at a distance from construction and demolition activities where sound would not transmit through the air-water boundary (University of Rhode Island and Inner Space Center 2023). Hence, there would be negligible or no noise impacts to marine biological resources. Green turtles that have the potential to haul out or nest on beaches within or near the ROI are discussed in Section 3.2, *Terrestrial Biological Resources*. For these reasons, marine biological resources are not evaluated further in this EA.

Public Health and Safety: During proposed construction activities, the public would not have access to construction sites. Construction sites would be fenced or otherwise access-controlled and visitor traffic at the Refuge would be detoured around construction as needed to prevent unauthorized access or exposure to any health or safety risks. All debris from new construction and the demolition of existing facilities would be handled and disposed of in a safe manner in accordance with applicable laws and regulations. Given Guam's World War II history, workers excavating for building foundations, roads, underground utilities, and other infrastructure in the Refuge could potentially encounter buried military munitions debris (including unexploded ordnance [UXO]). To reduce potential hazards, documentation would be prepared to outline specific measures that would be implemented to ensure the safety of workers and the general public. Such measures include having qualified UXO personnel perform surveys to identify and remove any munitions and explosives of concern items before beginning ground-disturbing activities. Because UXO would be identified and removed before beginning construction activities, the potential risk of direct or indirect impacts during construction from encounters with UXO would be negligible. Post-construction, the proposed road improvements and new facilities would provide wider, paved access and a dedicated pedestrian walkway along the Jeep Trail Road between the new DOI facilities and the Recreational Access Road along the beach. The design of road improvements and facilities would include elements to address potential safety issues associated with traffic congestion, parking, and walkway use. In addition, the proposed new Americans with Disabilities Act parking and associated access near the beach would be designed in compliance with the Architectural Barriers Act and provide safe access for visitors with disabilities. While beneficial, these effects would be less than significant.

Given that potential impacts to public health and safety during construction would be negligible or nonexistent, and post-construction effects on public safety would be beneficial (but less than significant), Public Health and Safety is not evaluated further in this EA.

Transportation: Within the project area, there are multiple roads providing various levels of access to and within the Refuge (see Figure 2-5):

- Highway 3A: a 2-lane paved road that provides access to the Refuge and to the existing DOI facilities and is currently used by visitors and staff accessing the Refuge and AAFB, and by residents who live on Urunao Road south of the Refuge.
- Urunao Road: an unimproved 2-lane road that intersects Highway 3A within the Refuge and provides access to private properties south of the Refuge.
- Recreational Access Road: a coastal unpaved road located entirely within the Refuge that provides access to beach recreational areas from the existing DOI facilities.

- Jeep Trail: a narrow unimproved path located entirely within the Refuge that connects the Recreational Access Road to Urunao Road and is currently used only by Refuge all-terrain vehicles due to dense foliage and rugged terrain.

Prior to the proposed construction, USFWS and the Marine Corps would coordinate to provide information to visitors about Refuge access, especially during potentially high visitation periods, such as weekends and school visitation days. A traffic control plan would also be developed and implemented to manage traffic during construction. The traffic control plan would include standard traffic management strategies such as adding the appropriate warning signs, using a flagger to manage traffic during lane closures, and adjusted speed limits if appropriate.

During the proposed construction of the DOI facilities, construction vehicles would access the site using Highway 3A and a small segment of Urunao Road adjacent to the site. Delivery of equipment and materials during construction would not prevent any vehicles from using the roadways or cause any roadway to be closed. The proposed action involves the realignment of Urunao Road near the new facility site. During construction of this road realignment, temporary access that avoids the construction (but remains within the project footprint) would be provided for residents along Urunao Road. Once the new facility and all road improvements are completed, the demolition of the existing facility would not impact Refuge visitors due to the new alternate routes for public access to the facility and recreation areas. Proposed construction to install utilities along Highway 3A would be implemented in phases, with any potential impacts minimized via standard work zone traffic management strategies.

Following construction, the proposed road improvements would provide public access to the new DOI facilities and to the Refuge's public recreation areas, especially those areas located outside the Range SDZ when the SDZ is activated (see also Section 3.4.2, *Recreation*). During days of high visitor use, there may be traffic congestion at the control gate between Day Use Sites 2 and 3, which may impact use of Site 3. Public use would be monitored, and adaptive management measures applied as appropriate.

When the MPMG Range and SDZ are not operating, the proposed road improvements would provide marginal improvement as an alternate access route to beach areas along Recreational Access Road via the improved Jeep Trail Road. However, when the MPMG Range is operational and the SDZ is activated, the road improvements would provide access to the beach and other recreational areas located outside the SDZ that would not otherwise be available.

For the reasons described above, the proposed action would result in negligible to beneficial impacts to vehicle use of Highway 3A, Urunao Road, and the Recreational Access Road and thus are not evaluated further in this EA.

Land Use: No new land use in the Refuge would result from the proposed action. The Refuge would continue to consist of approximately 375.5 acres of federal terrestrial land under the custody and control of DOI. While the proposed action would have a total project footprint of 22.46 acres (Alternative 1) or 19.46 acres (Alternative 2), including utility realignment outside the Refuge along Highway 3A, the existing facilities within the Refuge would be demolished and approximately 5.02 acres would be prepared for potential habitat restoration and regeneration of vegetation. Following construction of the replacement facilities, all the existing land uses would remain, including all conservation land uses and recreational opportunities. Given the absence of any impacts to land use, it is not evaluated further in this EA.

3.2 Terrestrial Biological Resources

Terrestrial biological resources include living, native, or naturalized plant and animal species and their habitats. Habitat is defined as the resources and conditions present in an area that support a plant or animal. The ROI for biological resources includes the 52-acre survey area and all components of the proposed action (replacement facilities, road improvements and utility realignments, removal of existing DOI facilities, and preparation of the site for potential habitat restoration and regeneration), areas of conservation measures, and any areas that may experience noise, runoff, or other direct or indirect impacts to flora and fauna or their habitat (Figure 3.2-1). In this EA, ESA-listed species are defined as species listed as threatened or endangered under the federal ESA.

3.2.1 Affected Environment

The following subsections provide an overview of the terrestrial biological resources within the ROI. Several surveys and studies have been conducted in this area; most relevantly the 52-acre terrestrial biological resources survey conducted in December 2021 within the project area to support this proposed action, which documented ESA-listed plant and wildlife species (Scheuerman and Camacho 2022). In 2024, additional surveys within 6 acres of the new facility focus area were conducted as part of the biological monitoring in support of the geotechnical borings and topographic mapping (B. Byamba, Environmental Science Corporation-Pacific, personal communication, April 21, 2024). As mentioned in the introduction to Chapter 3, the affected environment described in this section reflects the pre-typhoon conditions documented in the 2021 survey (apart from the 2024 survey described above); any additional species-specific conditions and considerations associated with Typhoon Mawar damage are described below in subsections for ESA-listed species. Figure 3.2-1 depicts all terrestrial biological resource data within the ROI from previous and recent surveys in relation to the project area, as some areas surveyed are no longer included in the proposed action.

3.2.1.1 Vegetation

The dominant vegetation type within the ROI is mixed limestone forest-foreslope, followed by developed land, coconut forest, and, to a lesser degree, mixed herbaceous scrub communities (Table 3.2-1, Figure 3.2-1) (Scheuerman and Camacho 2022).

Table 3.2-1 Vegetation Communities in the 2021 Survey Area

Vegetation Community	*Total Acres*
Casuarina Forest	0.16
Coconut Forest	6.44
Developed Land	13.29
Hibiscus Scrub	0.19
Hibiscus-Leucaena	1.42
Hibiscus-Ochrosia Scrub	0.90
Mixed Herbaceous Scrub	3.22
Mixed Limestone Forest-Foreslope	26.02
Mixed Limestone Forest-Plateau/Secondary	0.01
TOTAL	51.65

Sources: United States Forest Service 2006; AAFB 2008.

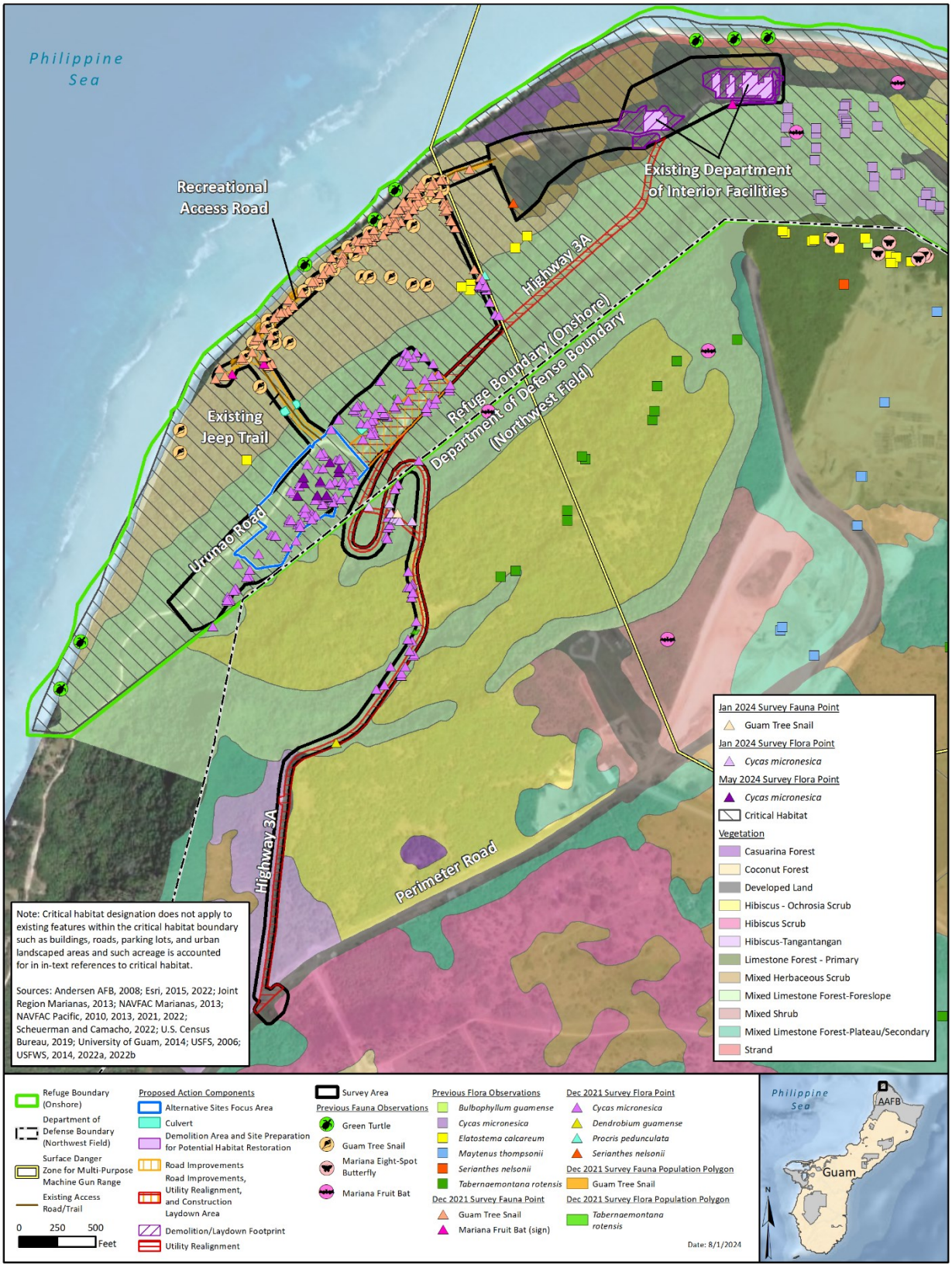


Figure 3.2-1 Terrestrial Biological Resources in the ROI

3.2.1.2 Wildlife

Wildlife species found within the ROI are typical of the northern region of Guam. Generally, wildlife populations, particularly birds, have been significantly impacted by BTS, and current populations are very low and rarely observed within forested regions. Examples of native wildlife observed at the Refuge include the blue-tailed skink (*Emoia caeruleocauda*), mutilating gecko (*Gehyra mutilata*), land hermit crab (*Coenobita brevimanus*), coconut crab (*Birgus latro*), and various native butterflies such as the blue-banded king crow butterfly (*Euploea eunice)* (USFWS 2022). The dominant invasive species in addition to BTS are Philippine deer (*Rusa marianna*) and feral pig (*Sus scrofa*).

The Refuge is an important flyway for migratory seabirds including the brown noddy *(Anous stolidus)*, wedge-tailed shearwater (*Puffinus pacificus*), white-tailed tropicbird (*Phaethon lepturus*), red-tailed tropicbird (*Phaethon rubricauda)*, brown booby (*Sula leucogaster*), red-footed booby (*Sula sula*), great frigatebird (*Fregata minor)*, black noddy (*Anous minutus)*, black-naped tern (*Sterna sumatrana*), and sooty tern (*Onychoprion fuscata)* (Guam National Wildlife Refuge and USFWS 2009). Nine additional species of migratory birds have been observed within the ROI, including Pacific golden plover (*Pluvialis fulva*), ruddy turnstone (*Arenaria interpres*), wood sandpiper (*Tringa glareola*), wandering tattler (*Tringa incana*), gray-tailed tattler (*Tringa brevipes*), sharp-tailed sandpiper (*Calidris acuminata),* Pacific reef heron (*Egretta sacra*), whimbrel (*Numenius phaeopus*), and ruff (*Calidris pugnax*) (NAVFAC Marianas 2013). Migratory wading birds are rare observations; however, open field regions of the Refuge have previously hosted cattle egret (*Bulbulcus ibis)*, little egret *(Egretta garzetta)*, and the intermediate egret (*Egretta intermedia*) (Pratt et al. 1987). Other migratory bird species observed in northern Guam in past studies outside of the ROI include yellow bittern (*Ixobrychus sinensis*), white tern (*Gygis alba*), barn swallow (*Hirundo rustica),* and fork-tailed swift (*Apus pacificus*) (NAVFAC Pacific 2010). Populations of seabirds and some shorebirds such as the Pacific golden plover and sandpipers have fared better than aforementioned bird populations, as they do not commonly utilize the preferred habitats of the BTS. All bird species listed above are protected under the Migratory Bird Treaty Act. The status of current populations of non-ESA birds within the Refuge is not well documented.

3.2.1.3 Critical Habitat

A designated terrestrial critical habitat is an area identified by USFWS as essential for the survival of a threatened or endangered species because it provides the necessary environment for them to live and reproduce. These areas contain the specific features, called primary constituent elements (PCEs), that the species need to thrive. In 2004, the USFWS designated the 375.5-acre terrestrial portion of the Refuge as critical habitat for the Mariana fruit bat or fanihi *(Pteropus mariannus mariannus)*, Mariana crow or aga *(Corvus kubaryi)*, and the Guam kingfisher or sihek *(Todiramphus cinnamomina)* (USFWS 2004). The Mariana crow and Guam kingfisher are considered extirpated from Guam, and only the Mariana fruit bat is known to utilize the ROI and associated critical habitat. The PCEs for the Mariana fruit bat and both extirpated birds can be found in limestone, secondary, ravine, swamp, agricultural, and coastal forests on Guam that exhibit the biotic and structural characteristics necessary for foraging, sheltering, roosting, nesting, and rearing of young (USFWS 2004). Only lands containing one or more of the PCEs are designated as critical habitat (USFWS 2004). Existing features and structures within the boundaries of the mapped units, such as buildings, roads, aqueducts, antennas, water tanks, agricultural fields, paved areas, lawns, and other urban landscaped areas do not contain the PCEs and therefore are not designated as critical habitat (USFWS 2004). Specific details of PCEs for each species are described below.

The PCEs required by the Mariana fruit bat include (1) plant species used for foraging, such as *Artocarpus* spp. (breadfruit), *Carica papaya* (papaya), *Cycas micronesica* (fadang), *Ficus* spp. (figs), *Pandanus tectorius* (kafu), *Cocos nucifera* (coconut), and *Terminalia catappa* (talisai); and (2) remote locations, often within 328 feet of cliff lines that are 260 to 590 feet tall, with limited exposure to human disturbance and that contain mature fig, *Mammea odorata* (chopak), *Casuarina equisetifolia* (gago), *Macaranga thompsonii* (pengua), *Guettarda speciosa* (panao), *Neisosperma oppositifolia* (fagot), or other tree species that are used for roosting and reproductive activity (USFWS 2004). Although the current population of Mariana fruit bats on Guam is small, and most Mariana fruit bats roost in a limited area, the foraging behavior and diverse diet of the Mariana fruit bats cause them to use large areas for foraging (Wiles et al. 1995; USFWS 2017). Their use of critical habitat in the project area is indicated by recent evidence from the 2021 surveys (Scheuerman and Camacho 2022). Thus, all the designated critical habitat for this species used for foraging is considered occupied (USFWS 2017). Though the 2021 surveys and Refuge staff monitoring indicate use of the area, and that the critical habitat contains the PCEs for the species, a recent discussion with Refuge personnel indicated that bats are rarely observed on the Refuge (Toni Mizerek, USFWS and Coralie Cobb, DON, personal communication, June 2023), indicating there are no roosts present on the Refuge.

The PCEs required by the Mariana crow include (1) emergent and subcanopy trees with dense cover for breeding such as fagot, pengua, *Intsia bijuga* (ifit), *Premna obtusifolia* (ahgao), *Eugenia reinwardtiana* (aabang), fig, *Elaeocarpus joga* (yoga), and *Tristiropsis obtusangula* (faniok); (2) sufficient area of predominantly native limestone forest to allow nesting at least 950 feet from the nearest road and 203 feet from the nearest forest edge to support Mariana crow breeding territories (approximately 30 to 91 acres) and foraging areas for nonbreeding juvenile crows; and (3) standing dead trees and plant species for foraging, such as *Aglaia mariannensis* (maypunayo), breadfruit, coconut palm, fagot, *Hibiscus tiliaceus* (pago), ifit, *Leucaena* spp. (tangantangan), *Ochrosia mariannensis* (langiti), kafu, ahgao, fig, and joga (USFWS 2004).

The PCEs required for the Guam kingfisher include (1) closed canopy and well-developed understory vegetation; (2) large (minimum of approximately 17-inch diameter at breast height), standing dead trees (especially faniok, *Pisonia grandis* [umumu], breadfruit, fig, and coconut palm); (3) mud nests of *Nasutitermes* spp. termites and root masses of epiphytic ferns for breeding; (4) sufficiently diverse structure to provide exposed perches and ground surfaces, leaf litter, and other substrates that support a wide range of vertebrate and invertebrate prey species for foraging kingfishers; and (5) sufficient overall breeding and foraging area to support kingfisher territories of approximately 25 acres each (USFWS 2004).

Critical habitat on the Refuge varies in quality based on species composition, forest structure, and distance to human disturbance. The critical habitat in the proposed facilities construction area includes some of the lowest quality habitat across the Refuge based on the vegetation, canopy, understory, and lack of remoteness required for the conservation of Mariana fruit bat, Mariana crow, and Guam kingfisher (T. Mizerek, Refuge Manager, personal communication, 2024). This area has likely continued to degrade without active management to remove invasive plants or animals (T. Mizerek, Refuge Manager, personal communication, 2024).

3.2.1.4 ESA-Listed Species

During the 2021 survey of the ROI, four ESA-listed plant species and one ESA-listed wildlife species were observed (Scheuerman and Camacho 2022) (Table 3.2-2). Evidence of presence (ejecta, referred to as

'sign') was observed for one additional ESA-listed wildlife species (Scheuerman and Camacho 2022). Figures 3.2-2 to 3.2-5 display the data provided in Figure 3.2-1, with greater magnification on various portions of the project area.

Table 3.2-2 ESA-Listed Species Known to or with Potential to Occur within the ROI

Scientific Name	*Common Name*	*Chamorro Name*	*Federal ESA Status*	*Potential to Occur in ROI*
Reptiles				
Chelonia mydas	Green turtle	Haggan	Endangered	Known to Occur[2]
Mammals				
Pteropus mariannus mariannus	Mariana fruit bat (Mariana flying fox)	Fanihi	Threatened	Known to Occur[1,2]
Invertebrates				
Hypolimnas octocula marianensis	Mariana eight-spot butterfly	Abbabang	Endangered	Moderate[2]
Samoana fragilis	Fragile tree snail	Akaleha	Endangered	Moderate[2]
Partula gibba	Humped tree snail	Akaleha	Endangered	Moderate[2]
Partula radiolata	Guam tree snail	Akaleha	Endangered	Known to Occur[1,2]
Plants				
Cycas micronesica	Federico nut	Fadang	Threatened	Known to Occur[1,2,3]
Serianthes nelsonii	Fire tree	Hayun lagu	Endangered	Known to Occur[1]
Tabernaemontana rotensis	No common name	No Chamorro name	Threatened	Known to Occur[1,2,3]
Bulbophyllum guamense[4]	No common name	Sagalasgas	Endangered	Moderate[3]
Tuberolabium guamense[4]	No common name	Applokhlåsu	Endangered	Moderate[3]
Heritiera longipetiolata[4]	No common name	Ufa-halomtano	Endangered	Moderate[3]
Dendrobium guamense	No common name	No Chamorro name	Threatened	Known to Occur[1,3]

Notes: Potential to occur in ROI: Moderate = Suitable habitat, documented in the vicinity of the ROI; Known to occur = Suitable habitat, and documented in the ROI. Note that species considered extirpated from Guam are not included.

Additional ESA-listed species with low potential to occur are not part of the Section 7 ESA consultation with USFWS (Mariana common moorhen, bridled white-eye, Mariana gray swiftlet, Guam rail, Mariana crow, Guam Micronesian kingfisher, Slevin's skink, little Mariana fruit bat, Mariana wandering butterfly, *Eugenia bryanii, Hedyotis megalantha, Maesa walker, Nervilia jacksoniae, Phyllanthus saffordii, Solanum guamense,* and *Tinospora homosepal*a).

[1]Species observed or indicator of presence (sign) during the 2021 biological surveys conducted for this EA (Scheuerman and Camacho 2022).

[2]Species observed in previous biological surveys (DON 2015).

[3]Species are known to occur in the forest enhancement area where conservation measures are located.

[4]Species is not included in Section 7 consultation as it is included only within areas designated for conservation measures to occur and is not likely to occur in the project area.

Sources: DON 2015; Government of Guam 2009; Guam Division of Aquatic and Wildlife Resources 2006; Scheuerman and Camacho 2022; USFWS 2022.

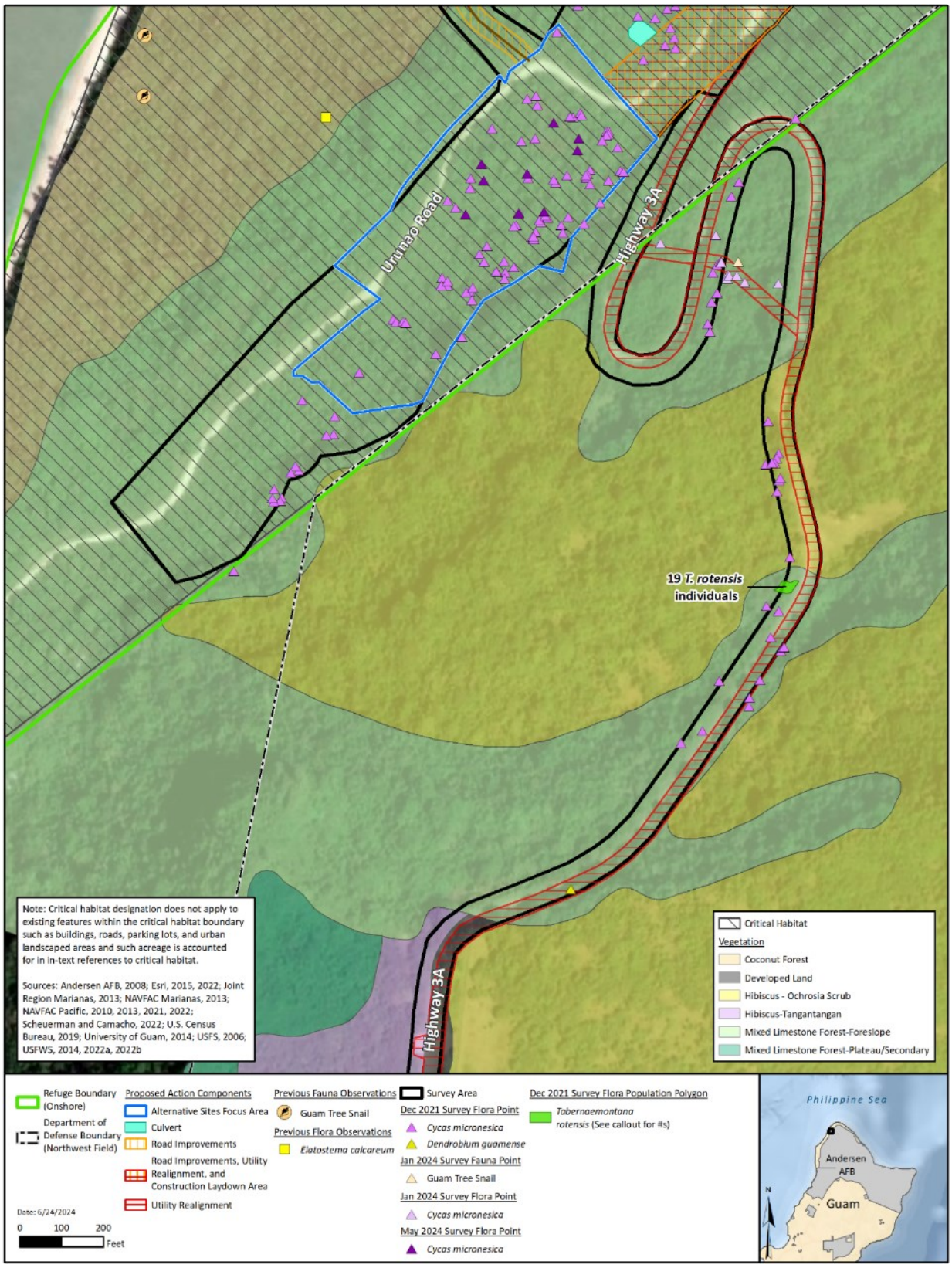


Figure 3.2-2 Terrestrial Biological Resources in the ROI – West

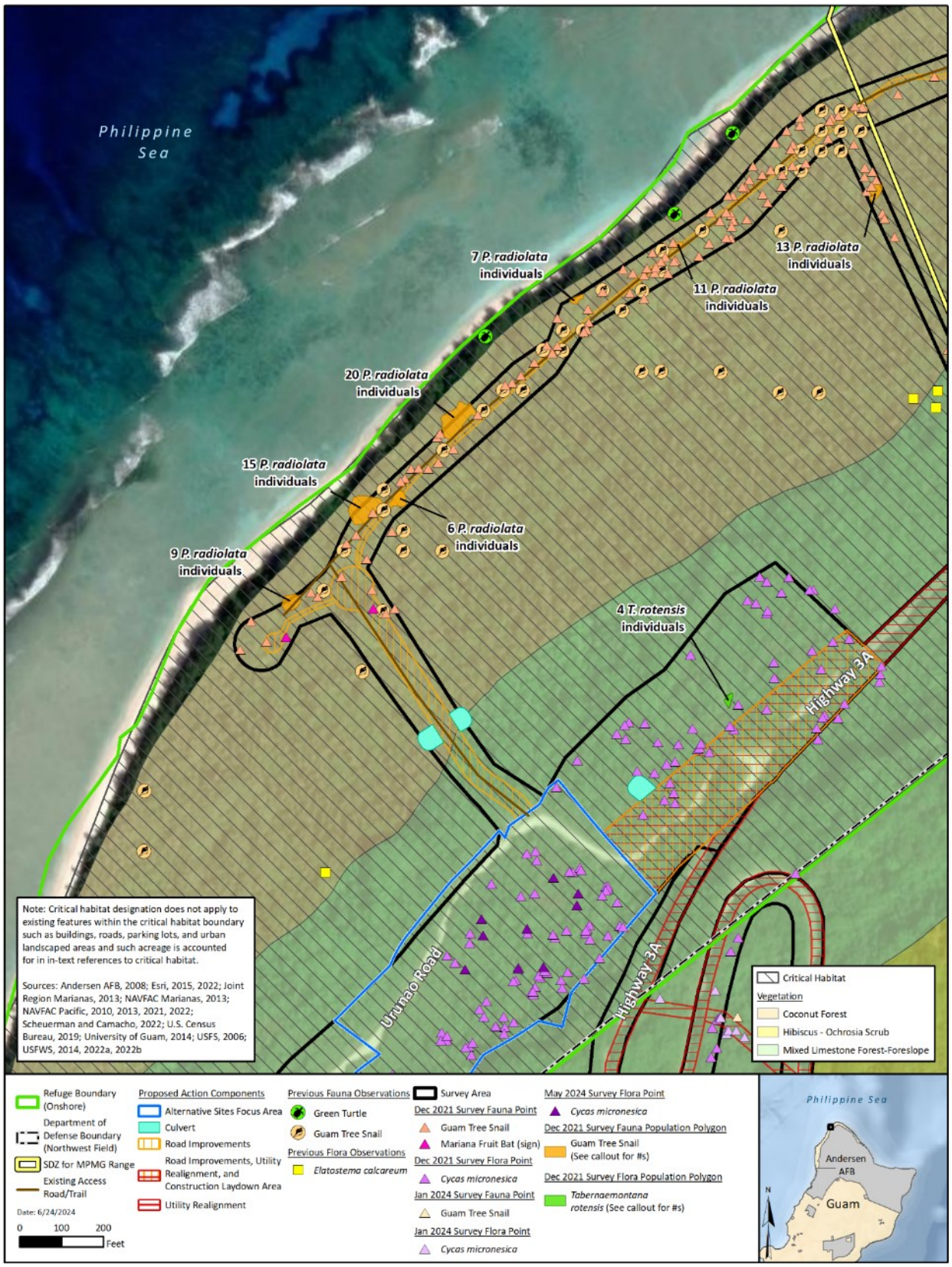


Figure 3.2-3 Terrestrial Biological Resources in the ROI – Northwest

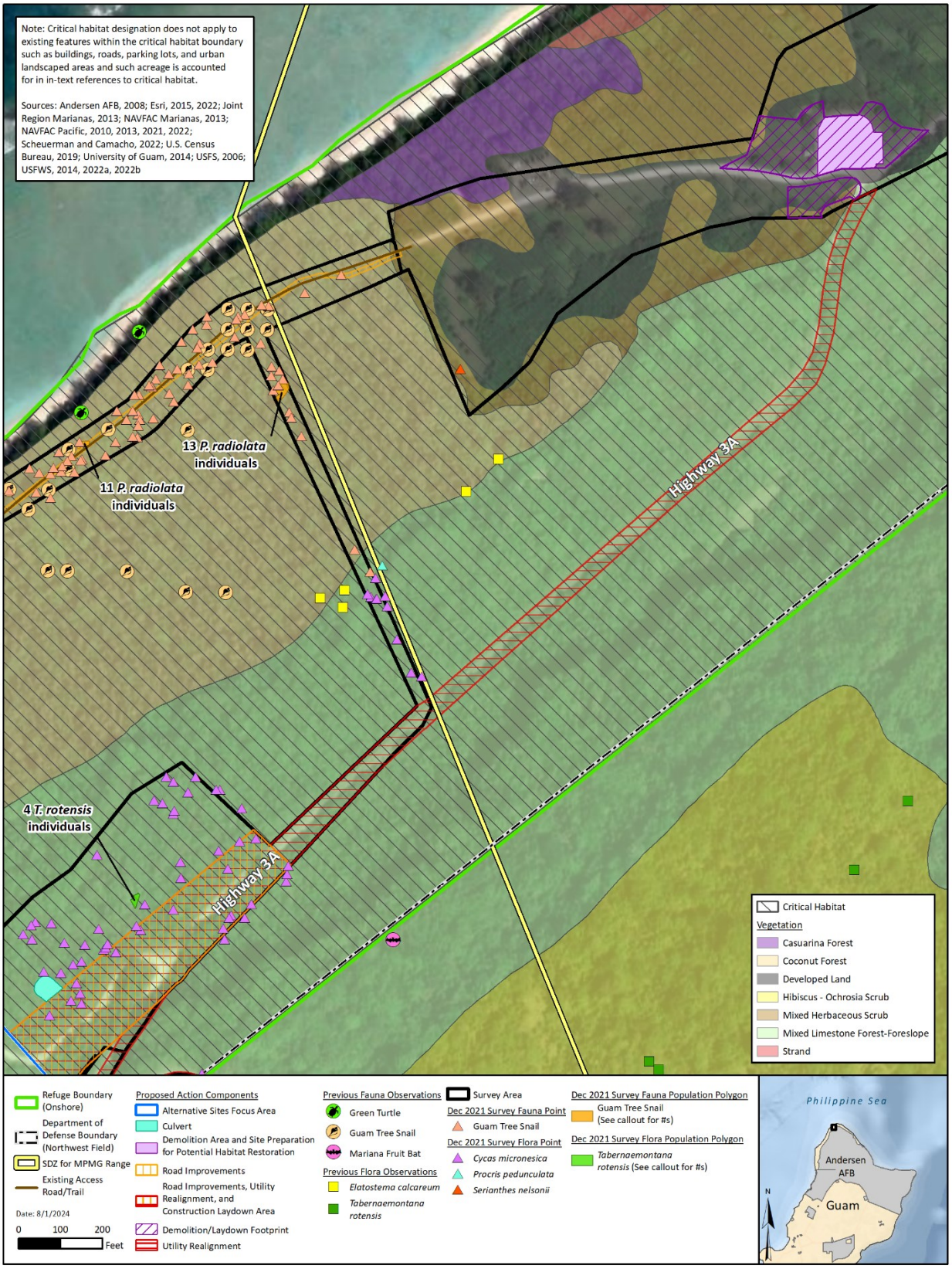


Figure 3.2-4 Terrestrial Biological Resources in the ROI – North

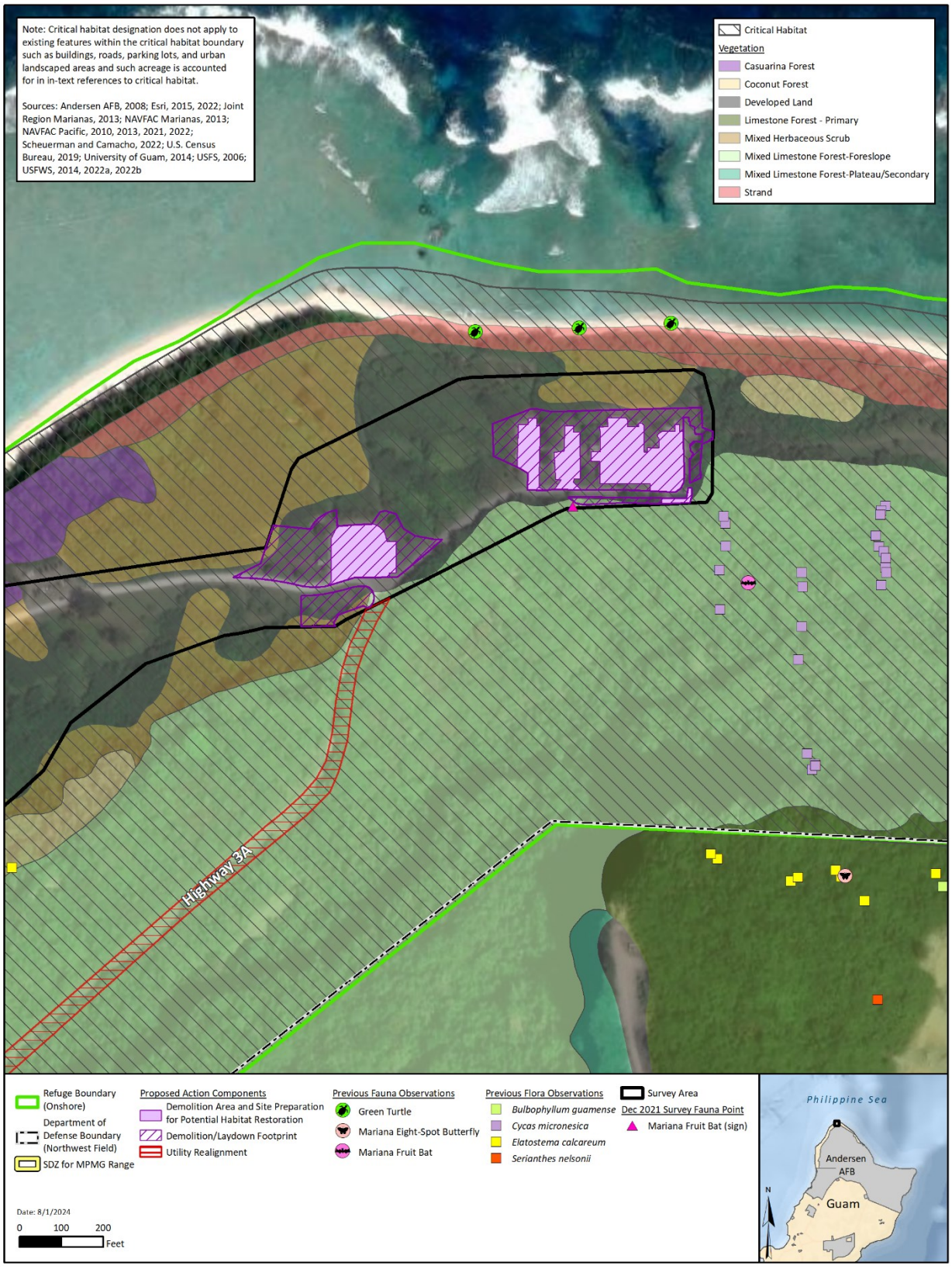


Figure 3.2-5 Terrestrial Biological Resources in the ROI – Northeast

ESA-Listed Plants

Four ESA-listed plant species have the potential to occur within the ROI and were observed during the 2021 biological surveys (see Table 3.2-3) (Scheuerman and Camacho 2022). An additional three ESA-listed plant species are known to occur within the forest enhancement areas on MCB Camp Blaz, which is proposed as the locations for conservation of listed *Cycas micronesica*. These areas selected for transplanting within the forest enhancement area will avoid any existing listed species occurring there. Per the 2023 Annual Report to USFWS, MCB Camp Blaz successfully met and exceeded the 50% survival criteria for all plant species salvaged and transplanted to forest enhancement areas in support of the Marine Corps Relocation construction program (MCB Camp Blaz 2023). An additional seven ESA-listed plant species are unlikely to occur in the project area and not addressed further in the EA (see notes on Table 3.2-3).

Cycas micronesica

During the 2021 surveys, a total of 182 *C. micronesica* individuals were recorded in the survey area, with 71 occurring within the focus area for the replacement facilities and 24 occurring within the Highway 3A utility realignment areas (see Figure 3.2-1) (Scheuerman and Camacho 2022). In 2024, 16 additional *C. micronesica* individuals were recorded within the waterline alignment and focus area, for a total of 111 trees in the overall project area (B. Byamba, Environmental Science Corporation-Pacific, personal communication, April 21, 2024). Individuals are common throughout the higher elevation limestone forest/woodland portions of the ROI (see Figure 3.2-1) (Scheuerman and Camacho 2022). Portions of the ROI near the beach are mapped as coconut forest and mixed herbaceous scrub having sandy soils that do not contain any *C. micronesica* (Scheuerman and Camacho 2022). No *C. micronesica* seedlings were observed in the ROI in 2021; all individuals observed were fully developed and considered to be in an "adult" stage (Scheuerman and Camacho 2022). During the 2021 surveys and within the focus area for proposed new facilities, 55 of the 71 individuals were in good or fair condition and 16 were dead or in poor condition (see Figure 2-2); within the Highway 3A utility realignment areas, 14 of the 24 individuals were in good or fair condition, and 10 were dead or in poor condition (see Figures 2-2 and 2-3) (Scheuerman and Camacho 2022). Those individuals in poor or dead condition were indicated to be suffering from infestation by the Asian cycad scale (*Aulacaspis yasumatsui*) (Scheuerman and Camacho 2022). During the 2024 surveys, the condition and the life stage of the 16 individual plants were not recorded. In 2020, the population of *C. micronesica* on Guam was projected to be between 123,000 and 538,000 individuals with an average annual rate of decline of 8.1 percent (USFWS 2020a). *C. micronesica* populations have declined with approximately 96 percent mortality from 2005 to 2020 due to the Asian cycad scale (Marler and Krishnapillai 2020).

A 2023 post-typhoon assessment of the ESA-listed *C. micronesica* tree conducted across northern Guam found that approximately 72% of trees on the northwestern coast were defoliated, of which, the majority exhibited 100% defoliation; additionally, 27% of trees were damaged by windsnap (Lindström et al. 2023). The low resilience of these trees to endure Typhoon Mawar, in contrast to historical typhoons of comparable data, suggests that declining plant health due to invasive scale insects was a factor. As a result, the research anticipates that an increase in plant mortality may occur over the subsequent 12–24 months after the typhoon as the unhealthy cycads struggle to fully recover.

Tabernaemontana rotensis

During the 2021 surveys, a total of 23 *T. rotensis* individuals were recorded in two separate stands in the ROI (Scheuerman and Camacho 2022). The two stands were within 10–30 feet from the Highway 3A

utility realignment areas, and none within the new facility focus area (see Figures 3.2-2 and 3.2-3) (Scheuerman and Camacho 2022). One of the stands (four individuals) appears to be planted and maintained, with two small trees and a sapling in good health and one dead individual (see Figure 3.2-4). The second stand (19 individuals), adjacent to the roadside along Highway 3A into the Refuge, contains relatively healthy-looking small trees (see Figure 3.2-3). In the 2015 Final EIS, *T. rotensis* individuals were found throughout northern Guam, including near the limestone cliffs in the northeast near Highway 3A (see Figure 3.2-1) (DON 2015). In 2020, the current abundance of *T. rotensis* on Guam was approximately 15,300 naturally occurring individuals. Population size estimates appear to be in decline due to factors such as habitat destruction from development, invasive animals, and typhoons, as well as disease and predation (USFWS 2020b). However, *T. rotensis* germination and seedling emergence are maximized in full sun conditions post-typhoon and may behave as a pioneer species after such events (USFWS 2023a).

Serianthes nelsonii

There is one known *S. nelsonii* within the proposed site preparation area for potential habitat restoration and regeneration in the vicinity of the existing facilities, which is actively managed by Refuge staff (see Figure 3.2-4) (Scheuerman and Camacho 2022). The known individual is an out-planted, fenced-off sapling with signage indicating it is an endangered tree. The sapling is in poor condition with low leaf growth and vigor, occurring in an area mapped as mixed herbaceous scrub adjacent to a mowed/manicured area.

Dendrobium guamense

A single *D. guamense* individual (an epiphytic species, which grows on another plant or object for physical support) is known to occur on an *Intsia bijuga* branch above Highway 3A within the area proposed for utility realignment (see Figure 3.2-2) (Scheuerman and Camacho 2022). The species typically occurs within lowland/limestone forests and savanna.

Tuberolabium guamense, Heritiera longipetiolata, and *Bulbophyllum guamense*

The proposed action includes conservation measures that would require the transplanting of cycads within the forest enhancement areas at MCB Camp Blaz. Though the areas selected for transplanting will avoid any existing listed species, *Tuberolabium guamense*, *Heritiera longipetiolata*, and *Bulbophyllum guamense* are known to occur within the MCB Camp Blaz forest enhancement areas (C. Cobb, personal communication, 2024).

ESA-Listed Wildlife

Six ESA-listed wildlife species have the potential to occur within the ROI (see Table 3.2-3). Although "suitable habitat" for many special-status species is present within the ROI, the BTS is still considered abundant and widespread on Guam and in the ROI and is the primary factor in the extirpation of special-status wildlife species on Guam. While BTS is present within the Refuge, the existing habitat is not suitable to support the survival of at-risk special-status species such as birds and lizards. Due to extirpation or unsuitable habitat, an additional nine ESA-listed wildlife species are not addressed further in the EA (see notes on Table 3.2-3). The six ESA-listed wildlife species that have the potential to occur within the ROI are discussed below.

Tree Snails

No occurrences of the fragile tree snail *(Samoana fragilis)* or the humped tree snail *(Partula gibba)* were recorded; however, these species in juvenile stages are difficult to distinguish from one another and from the Guam tree snail *(Partula radiolata)* and therefore are considered to have the potential to occur in the ROI (Hopper and Smith 1992; USFWS 2020c, 2020d). Guam tree snails were abundant in the coastal, lowland portions of the ROI during the 2021 surveys (Scheuerman and Camacho 2022). In total, 320 individuals were mapped within the ROI in 2021, but none occurred within the new facility focus area (see Figure 3.2-1) (Scheuerman and Camacho 2022). Guam tree snails were common in portions of the ROI mapped as coconut forest and were particularly common along the Recreational Access Road and near the intersection of the Recreational Access Road and the existing Jeep Trail Road (see Figures 3.2-3 and 3.2-4). One Guam tree snail was observed in 2024 along Highway 3A in the area proposed for utility realignment (B. Byamba, Environmental Science Corporation-Pacific, personal communication, April 21, 2024). No Guam tree snails were observed in 2021 or 2024 in the higher elevation plateaus or in the easternmost portions of the ROI, specifically in the proposed new facilities focus area, most of the Jeep Trail Road, Urunao Road, nor in the demolition area (Scheuerman and Camacho 2022). While much biological information is not known for tree snails on Guam, generally they need cool, shaded forest habitat with high humidity and reduced air movement that prevents excessive water loss and do not appear to require specific host plants. Currently, the Guam tree snail is distributed across Guam in potentially more than 50 locations and populations range from a few individuals to a few thousand, though overall numbers have not been quantified (USFWS 2020e). For all three species, the number of tree snail individuals per location has rarely been reported and has typically been anecdotal (USFWS 2020c, 2020d, 2020e). Changes in population and location of sites occupied may reflect differences in survey efforts or differences in definition of population and may not represent changes in abundance; therefore, systematic comparisons of abundance over time are not possible (USFWS 2020c, 2020d, 2020e).

In addition, per anecdotal information provided by the Refuge manager, damage from Typhoon Mawar included downed trees in the area inshore from the Recreational Access Road in which snails had been previously documented. The Refuge staff moved over 1000 snails found on downed vegetation to a new location outside of the proposed construction footprint (T. Mizerek, USFWS and J. Scarborough, DON, personal communication, 2024). Not all snails in the area were moved as vegetation that was not within the Recreational Access Road remained in place. It is unknown what percentage of tree snails were moved off the vegetation along this road.

Mariana Fruit Bat

The Mariana fruit bat has potential to occur throughout the ROI. Although no individual Mariana fruit bats were observed during the 2021 surveys, evidence of bat foraging (sign) in the ROI was observed in three separate locations (see Figures 3.2-3 and 3.2-5) (Scheuerman and Camacho 2022). The bat sign observed consisted of ejecta, which is the portions of condensed fruit fibers and seeds the bat spits out while foraging (Aziz et al. 2021). The 2021 surveys documented the evidence of bats within the Recreational Access Road and Jeep Trail Road improvement areas (approximately 600 feet from the proposed facilities' site), and within the demolition area (less than 30 feet from the existing facilities) (Scheuerman and Camacho 2022). Previous surveys documented a fruit bat sighting 200 feet south of the demolition area boundaries, another sighting at 250 feet southeast of utility realignment along Highway 3A or 800 feet northeast of the proposed new facilities, and a sighting 750 feet east of the demolition area (see Figures 3.2-1 through 3.2-5) (DON 2015; NAVFAC Marianas and AAFB 2015).

Habitat for the Mariana fruit bat is discussed in Section 3.2.1.3, *Critical Habitat*. The presence or absence of potential roost or forage tree species within the project area boundaries were not recorded within the 2021 surveys; however, mature trees were observed, and fruit bats establish roosts primarily in mature native trees within landscapes dominated by native forest (Wiles 1987; Scheuerman and Camacho 2022). While there is evidence of bats foraging within the project footprint, there are no known colonies (a population of bats which aggregate/roost together at a particular location) of bats on the Refuge and the closest potential colony is near the combat arms training and maintenance range on AAFB (see Figure 3.2-1) (NAVFAC Pacific 2023; Scheuerman and Camacho 2022).

Mariana Eight-Spot Butterfly

No occurrences of Mariana eight-spot butterfly (*Hypolimnas octocula marianensis*) were documented in the ROI during the 2021 surveys (Scheuerman and Camacho 2022). *Procris pedunculata* and *Elatostema calcareum* are host plants for the butterfly's reproduction as well as a food source for larvae (Schreiner and Nafus 1996). Adult butterflies are generally observed in proximity to these larval stage host species (Rubinoff and Holland 2018; Demeulenaere et al. 2018). Population sizes of this species are not well documented, however, habitat loss (such as due to typhoons, non-native plant and animal populations, and development) and fragmentation along with reduced connectivity between host plant populations is a likely cause for the species' presumed low numbers (USFWS 2020f). The species is also at risk due to predation by ants and parasitic wasps (USFWS 2020f). An individual host plant (*P. pedunculata*) was observed growing on a near-vertical cliff 30 feet outside of the ROI in 2021, in an area that is no longer included in the project area (see Figure 3.2-4) (Scheuerman and Camacho 2022). Other known locations of host plants were identified in previous surveys conducted in 2012 and 2013. Those surveys documented Mariana eight-spot butterfly host plant *E. calcareum* on steep topography outside of the 2021 survey boundaries, specifically, one plant 225 feet northwest of the proposed new facilities, three plants 275 feet northwest of the utility realignment on Highway 3A near the 2021 *P. pedunculata* observation, and two plants within 150 feet south of the demolition area to be prepared for potential habitat restoration and regeneration (see Figures 3.2-1 through 3.2-5) (NAVFAC Marianas 2013; NAVFAC Pacific 2013; University of Guam 2014). Observations of adults, eggs, and chrysalis on these host plants were documented along the cliff line (approximately 1,000 feet southeast of the ROI) and current data on the status of these plants or the use of them by the butterfly is not available (see Figures 3.2-1 through 3.2-5) (NAVFAC Marianas 2013; NAVFAC Pacific 2013; University of Guam 2014). Due to ungulate presence and their well-documented damage to accessible vegetation via trampling or consumption, host plants for the Mariana eight-spot butterfly are unlikely to occur in areas unprotected by significantly steep topography, such as near-vertical cliffs (USFWS 2014).

Green Turtle

Known beach haul-out locations and nesting for green turtles (*Chelonia mydas*) within the Central West Pacific Distinct Population Segment are documented in the ROI along the west and north boundaries; potential haul out and nesting areas are within 100 feet of the Jeep Trail Road, within 200 feet of the facilities proposed for demolition, and within 900 feet of the proposed new facilities (recorded observations are shown in Figures 3.2-3 to 3.2-5) (Scheuerman and Camacho 2022). Sea turtles hauled out on the beach have been described as sensitive to human presence by former Refuge staff, leaving their resting positions and returning to the water when people are nearby (J. Horeg, personal communication, July 10, 2023). The current status of green turtle use of beaches within the ROI is not well documented; however, between January 2017 and April 2024, at least 66 sea turtle nests were documented at the Refuge from the western boundary to the sandy area in front of the administration

building (NAVFAC Pacific 2024b). Measures taken to protect the green turtle would also apply to the hawksbill turtle (*Eretmochelys imbricata*) should this species be observed, which has not yet been identified within the ROI.

3.2.2 Environmental Consequences

Potential impacts to terrestrial biological resources may result from (1) physically altering, damaging, or destroying all or part of a resource; (2) changing the habitat or physical features surrounding the resource; or (3) introducing stressors such as light, noise, or pollution that diminish the integrity of the surrounding environment.

Under NEPA, the significance of an impact to terrestrial biological resources varies greatly depending on the context and location of the proposed action but is based on the potentially affected environment and the degree of effects of the action. While a proposed action could be determined under the Section 7 process to have an adverse effect on an ESA-listed species, that adverse effect under NEPA may not constitute a significant impact. The project's conservation measures (see Table 3.2-4) are designed to avoid or minimize project effects to listed species and critical habitat or to contribute to the recovery of a listed species. Conservation measures are considered an integral part of the proposed action and are vital to determining the impact of the proposed action. Implementation of conservation measures is required under the terms of the proposed action. After the conservation measures have been fully implemented, the long-term management of the species addressed in this EA and associated consultation within the project footprint are the responsibility of the Refuge. These conservation measures would be implemented to avoid and minimize adverse effects to ESA-listed species and their habitats and would reduce the effect of the action under NEPA.

Project components considered for impact analysis in this EA include the proposed new facility site for both Alternative 1 and 2, utility realignments along Highway 3A, the Jeep Trail Road improvements, Urunao Road realignment and improvements (including utility realignment and construction laydown) proposed near the intersection with Highway 3A, and the demolition/site preparation area at the existing DOI facility location. The Recreational Access Road improvements would be limited to pothole filling to provide a level surface and would not be anticipated to introduce any new impacts to terrestrial biological resources (see Section 2.2).

Table 3.2-3 presents a summary of acreage values for selected project components under both Alternative 1 and Alternative 2, including estimates of how many acres of critical habitat would be cleared under each alternative. Detailed acreage calculations described for the proposed action can be found in Table E-1 of Appendix E.2.

Table 3.2-3 Acreage Summary of Proposed Action Components

Proposed Action Component *(see Figure 2-5)*	*Alternative 1*		*Alternative 2*	
	Acres[1]	*Critical Habitat Acres to be Cleared[2]*	*Acres[1]*	*Critical Habitat Acres to be Cleared[2]*
Replacement Facilities (within Focus Area) – Phase 1	7.51	6.93	4.51	3.93
Road Improvements[3] – Phase 1	4.36	3.24	4.36	3.24
Utility Realignment – Phase 1	7.08	0.59	7.08	0.59
Phase 1 Subtotals:	*18.95*	*10.75*	*15.95*	*7.75*
Demolition/Laydown Footprint – Phase 3	3.52	0	3.52	0
Demolition of Buildings, Walkways, and Parking Lots[4]	*1.42*	0	*1.42*	0
Totals:	**22.46**	**10.75**	**19.46**	**7.75**

Notes: [1]Numbers may not add up due to rounding, and acres as shown in the table are composed of various land use types (e.g., structures, roads, vegetation, etc.) and are representative of polygons as shown in Figure 2-5.
[2]A total of 11.27 acres of critical habitat exists within the proposed action area for Alternative 1 (and 8.27 acres for Alternative 2), of which 10.75 acres would be cleared (7.75 acres for Alternative 2). A total of 11.94 acres of vegetation (10.75 acres of critical habitat and 1.19 acres of non-critical habitat) would be cleared for Alternative 1 and a total of 8.94 acres of vegetation would be cleared for Alternative 2 (7.75 acres of critical habitat and 1.19 acres of non-critical habitat).
[3]From Figure 2-5, this component includes the polygons labeled "Road Improvements" and "Road Improvements, Utility Realignment, and Construction Laydown Area."
[4]These acres are a subset of the "Demolition Area with Laydown (Phase 3)" acreages and are not an additional value within the totals for each alternative.

3.2.2.1 No-Action Alternative

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

3.2.2.2 Alternative 1

Vegetation

The approach to analysis for impacts to vegetation involves identifying all portions of the project area containing existing vegetation. The existing affected environmental conditions described in Section 3.2.1.3 are considered in contrast to proposed alterations to the vegetative environment in each area (see Section 2.2) to evaluate potential impacts to vegetation.

Densely vegetated plant communities throughout the facilities construction site would be cleared and replaced with impervious surfaces for facilities and parking. Proposed facilities construction would result in the permanent clearance of approximately 6.93 acres of mixed limestone forest-foreslope vegetation, and an additional 5.01 acres of mixed native/non-native vegetation (including coconut forest and hibiscus scrub) would be cleared along existing roads (3.97 acres for Highway 3A and utility realignment, 0.88 acres along the Jeep Trail Road and turnaround, and 0.16 acre for culverts). These areas make up a marginal amount of acreage within the 375.5-acre Refuge area, as well as compared to the approximately 9,000 acres, 500 acres, and 1,200 acres of similar limestone forest vegetation, coconut forest, and mixed-hibiscus scrub, respectively, in northern Guam (U.S. Forest Service 2006; AAFB 2008). At the demolition area, 1.42 acres of existing developed land (facilities and parking lots) would be demolished and prepped for potential habitat restoration and regeneration. Vegetated portions around the demolition area consist of planted landscape material or voluntary non-native vegetation with no notable ecological communities. While mixed limestone forest-foreslope vegetation can be found along

the southern border of the existing facilities, demolition activities would not impact areas outside of the developed premises (see Figure 3.2-5). The implementation of measures in Table 3.2-4 to minimize dust, runoff, and erosion impacts would further reduce potential impacts of demolition.

Although 11.94 acres of existing vegetation would initially be impacted from proposed action activities, the quality of habitat, including vegetation, across the Refuge would be enhanced in a variety of ways. The Refuge proposed and the DON agreed to fund the Refuge to undertake the collection and outplanting of native plant species (key to critical habitat) in several netted focal areas (including the demolition area if suitable after demolition) and across the Refuge where appropriate as shown in Figure 3.2-6. Part of the existing success within MCB Camp Blaz forest enhancement areas was the utilization of netting to enclose smaller areas to make ungulate eradication work more efficient and manageable (MCB Camp Blaz 2023). Similarly, this measure would minimize the construction impacts on vegetation by providing protection from ungulates and enhancement of forest vegetation in areas already demonstrating the appropriate substrate and microclimate to support outplantings. In addition, MCB Camp Blaz successes in seed collection and transplanting into protected forest areas provides proven processes for many of the species proposed for outplanting as part of this conservation measure. MCB Camp Blaz successfully met and exceeded the 50% survival criteria for all plant species salvaged and transplanted to forest enhancement sites in support of the Marine Corps Relocation construction program (MCB Camp Blaz 2023). Plant species that are now under MCB Camp Blaz custody (followed by survival rate in parenthesis) include *Bulbophyllum guamense* (83%), *Cycas micronesica* (79%), *Dendrobium guamense* (96%) and *Tuberolabium guamense* (70%) (MCB Camp Blaz 2023). Also, commensurate forest enhancement began and made substantial progress with the October 2021 completion of ungulate fences and ungulate eradication within a 679-acre forest enhancement site at MCB Camp Blaz, laying the foundation for ongoing native species outplanting and invasive plant removal (MCB Camp Blaz 2023). This conservation effort would include:

1. Approximately 4.7 acres of medium-quality habitat in two areas would be protected from ungulates with mesh netting fence, invasive plants would be removed, and plant species would be outplanted to enhance the forest structure and provide additional elements. The areas selected for netting, invasive control and transplanting would also maximize distance from roads and people. The additional protection and active management should result in recruitment of the plant species and large trees required for Guam kingfisher nesting, dense cover and subcanopy for Mariana crow and augmented foraging opportunities, all of which are not currently available on the Refuge.
2. An additional 0.3 acre of low-quality habitat would also be enhanced as described immediately above. This area would be near the Refuge facilities and nursery. The proximity to the proposed new facilities would provide the opportunity to educate and engage the public about critical habitat, habitat restoration and regeneration, and protection from ungulates, but would be more exposed to disturbance from roads and people.



Figure 3.2-6 Proposed Netted Areas within the Refuge

3. The Refuge would increase vegetation for foraging, breeding, roosting, nesting as well as the habitat complexity required for Mariana fruit bat, Mariana crow, and Guam kingfisher across the entire area. Of the PCE plant species, many would be outplanted in their respective appropriate habitats. Each outplanting would be protected from ungulates with barriers since these outplantings would not be within netted areas. Invasive plants would be removed within a buffer around each outplanting. This is not likely to initially enhance recruitment since ungulates are likely to damage any additional seedlings but with established mature trees that provide the PCE functions, the birds and bat may be able to use more of the Refuge critical habitat. The Refuge would continue to work toward increasing ungulate control, creating additional exclusions or eradication to further support recruitment of native and PCE species.
4. The current Refuge facilities are in an area not designated as critical habitat and are proposed to be demolished, thereby creating an opportunity for potential habitat restoration and regeneration. The area around the existing nature center and administration building, along with the existing parking lots, would be netted after infrastructure is demolished and topsoil is placed (2.10 acres total). Native vegetation suitable for beach strand and exposed conditions would initially be outplanted followed by PCE species if suitable. These areas remain within locked Refuge gates but also within the MPMG SDZ; therefore, restoration and Refuge management would occur when the areas are accessible.

The enhancement of the 5.02 acres of existing habitat and outplanting of individual plants throughout the Refuge and potentially within the 2.10 acres of netted area in demolition area would minimize the impact to vegetation by enhancing existing low- and medium-quality vegetation, and would provide opportunities to educate the public about the importance of vegetation and it's function in the Guam ecosystem (see *Critical Habitat* subsection below within Section 3.2.2.2) (see Figure 3.2-5). The continued use of these protocols for transplanting and propagating native species and controlling ungulates to allow habitat regeneration at the Refuge would minimize and help to offset impacts to critical habitat and affected species. In addition, Alternative 1 would result in improved access to manage natural resources on the western side of the Refuge. Given the small amount of vegetation that would be replaced with impervious surface, the establishment of new vegetation, and the overall minimal loss within the Refuge, the impacts of Alternative 1 construction to vegetation would be less than significant.

Wildlife

Temporary impacts could occur from the disturbances associated with proposed construction activities. The approach to analysis for impacts to wildlife involves identifying all potential stressors within the ROI including habitat loss, risk of strike, risk of fallout/light disorientation, and noise disturbance. For each stressor, potential impacts to wildlife are considered by evaluating potential differences between the affected environment described in Section 3.2.1.3 and the proposed alterations in each project site (see Section 2.2).

Loss of Habitat. Construction within the proposed action would result in clearance of approximately 11.94 acres of potential wildlife habitat (6.93 acres for proposed facilities, 3.97 acres for Highway 3A and utility realignment, 0.88 acre along the Jeep Trail Road and turnaround, and 0.16 acre for culverts). Direct impacts to wildlife habitat associated with construction and demolition activities would include temporary displacement throughout the project area of the few birds rarely observed in the ROI, reptiles such as the blue-tailed skink and mutilating gecko, and invertebrates such as the coconut crab and the blue-banded king crow butterfly; and some permanent displacement from the new developed areas (e.g., new DOI facility complex and the paved Jeep Trail Road). Based on the small loss of habitat

from construction, the forest enhancement of 5.02 acres, outplanting throughout the Refuge, and potential for vegetative regrowth over time at the 2.10-acre netted area at the demolition area, the proposed action would not result in long term permanent impact to the populations. Construction activity for road improvements and utility realignment would be temporary and would not present major barriers to wildlife seeking to disperse, as routes to disperse would be available and not blocked by construction along roads (no regions would be surrounded by construction due to road/utility realignment); and once completed and restored to existing conditions, the improved roads and realigned utilities would not prevent normal wildlife behaviors.

No existing habitat for wildlife would be lost at the demolition area. Rather, approximately 2.10 acres at the demolition area would be prepared for the potential habitat restoration and regeneration by Refuge management activities (see Figure 3.2-5 and Figure 3.2-6) (see *Critical Habitat* in Section 3.2.2.2). Potential habitat for wildlife at the demolition area near the infrastructure consists of some individual trees with no noted ecological communities. While suitable habitat for wildlife can be found adjacent to the demolition area on the southern border, demolition activities would not occur outside of the developed area (see Figure 3.2-5).

Although 11.94 acres would initially be impacted from proposed action activities, the enhancement of 5.02 acres of existing habitat, outplanting throughout the Refuge, and the potential for 2.10 acres of habitat restoration and regeneration in the netted area at the demolition area would minimize the impact to vegetation by enhancing existing low- and medium-quality vegetation to be used by existing wildlife. The enhanced habitat would also provide opportunities to educate the public about the importance of vegetation, wildlife use of the habitat, and its function in the Guam ecosystem (see *Critical Habitat* below within Section 3.2.2.2) (see Figure 3.2-5). In addition, Alternative 1 would result in improved access to manage natural resources on the western side of the Refuge. Given the paucity of wildlife within the ROI due to BTS, the enhancement of existing habitat, and the overall minimal loss in relation to total comparable habitat types within northern Guam, the impacts of Alternative 1 construction to wildlife from loss of habitat would be less than significant.

Risk of Strike. There is a very slight risk of injury or death to wildlife due to vehicle or equipment collisions during construction and demolition. Few species are expected to be present, and mobile species within the construction and demolition areas would move away during active construction and demolition. Small, less mobile species, and those seeking refuge in burrows, such as land crabs or small reptiles, could inadvertently be killed due to strike; however, long-term permanent impacts to populations of such species would not result because these species are sufficiently present in surrounding areas. Vegetation clearing has the potential to expose new food sources such as insects and nutrient dense organic matter, which could attract wildlife to areas of disturbance; however, wildlife would avoid active machinery and forage during less active or inactive hours. To reduce attraction of wildlife to the construction and demolition areas, measures described in Table 3.2-4 would be adopted to prevent temporary ponding and excess lighting, which may attract shorebirds. As a result, along with the implementation of measures in Table 3.2-4, Alternative 1 would result in less than significant impacts to wildlife due to strike.

Risk of Fallout/Light Disorientation. Bird fallout can occur when unnatural lighting at night attracts and disorients birds (particularly seabirds) to areas that would place them in dangerous conditions leading to their injury or death, as well as increased risk for potential strikes. While observations of resident populations on island are rare due to BTS, seabird and shorebird species, such as plovers and sandpipers, are attracted to facilities with lights, so lighting use during nighttime construction or

demolition is a potential stressor to nocturnal or light-sensitive bird species. Native species such as the nocturnal coconut crab may also experience impacts of unnatural lighting. To reduce this potential impact, construction and demolition would minimize activity during nighttime. Following construction, outside area lighting at the replacement facility site would be fully shielded to avoid impacts to sensitive species, meeting UFC 3-530-01 ratings to reduce illumination of sensitive habitats within the Refuge. As such, along with implementation measures in Table 3.2-4 to reduce lighting impacts, Alternative 1 would have less than significant impacts to birds and other native species due to fallout.

Noise Disturbance. Noise-sensitive species within the ROI are minimal as few birds are expected to be present due to BTS, however, construction and demolition-related daytime noise may temporarily displace other noise-sensitive species, such as lizards or land crabs, from habitat in the ROI (Mancera and Phillips 2023; Shintia et al. 2021). Noise related to such activities would not exceed levels up to 90 decibels (dB) at 50 feet, which attenuates to less than 64 dB at 1,000 feet (see Section 3.8, *Noise*). While short-term noise disturbance may temporarily impact suitable habitat for wildlife in the vicinity of the construction sites, species such as lizards and land crabs could relocate to other areas of suitable habitat in the vicinity and could return to noise-disturbed areas after construction. Studies have also shown that wildlife can habituate to noise following regular exposure and cease to respond behaviorally to the noise, and therefore, wildlife may not choose to leave the area if the noise levels are below the threshold of disturbance (Shannon et al. 2016; Larkin et al. 1996; National Park Service 1994). Thus, wildlife in the vicinity of construction and demolition would be expected to either relocate or habituate to the increase in noise from these activities. An increase in vehicular traffic on a portion of Urunao Road and on the improved Jeep Trail Road would produce additional daytime noise; however, it would result in the same outcome of wildlife either relocating or habituating. Considering the temporary and intermittent nature of the construction and demolition activities during daylight hours (see Section 3.8, *Noise*), Alternative 1 would have less than significant noise impacts to wildlife.

Critical Habitat

Current threats to habitat on Guam include habitat loss, degradation, and fragmentation due to development, military training, and fire; human disturbance; introduced ungulates; invasive plants; and non-native predators. These threats in other locations on the island put increasing stress on the importance of the remaining habitat, including the critical habitat at the Refuge. Permanent impacts to designated critical habitat for the Mariana fruit bat, Guam kingfisher, and Mariana crow would occur from disturbances associated with construction activities. The approach to analysis involves consideration of the existing affected environmental conditions as described in Section 3.2.1.3 in contrast to proposed alterations in all project sites to evaluate potential changes to the critical habitat. Additionally, conservation measures that would minimize the effects of the proposed construction activities on critical habitat are considered in the analysis.

Of the total 22.46-acre project area, 11.27 acres are critical habitat, of which 10.75 acres are proposed to be cleared of vegetation during construction. This loss of 10.75 acres would reduce the current 375.5 acres of critical habitat in the Refuge to 364.8 acres. In accordance with the MOA, the DON would prepare the demolition area for potential habitat restoration and regeneration. Originally DON was to undertake an initial planting of native vegetation at the demolition area, including the translocation of native plants from the new facilities construction area or from DON nursery stock (if available). However, after additional discussions between DON and the Refuge regarding uncertainty about the substrate at the demolition area and efficacy of focusing critical habitat minimization measures there, the Refuge proposed and the DON agreed to fund the Refuge to undertake the collection and

outplanting of key critical habitat species to several focal areas (as well an additional acreage at the demolition area if suitable after demolition) and across the Refuge where appropriate (see Figure 3.2-6). This measure would minimize the construction impacts on critical habitat by providing protection from ungulates and enhancement of critical habitat in areas already demonstrating the appropriate substrate and microclimate to support outplantings.

Under this conservation measure, DON would fund the Refuge to collect plant material, propagate, outplant, and maintain specific key critical habitat PCE plant species for the benefit of the Mariana fruit bat, Mariana crow, and Guam Micronesian kingfisher in certain areas selected by the Refuge. The Refuge would target the outplanting of sufficient plants to ensure that 488 genetically unique individuals of 15 different key native PCE species would achieve fruiting twice (Table 3.2-4). As mentioned in Section 3.2.2.2 *Vegetation*, the Marine Corps has established processes for seed collection and transplanting various native plant species on Guam. These efforts have shown survival success for all species transplanted and provide a reference for outplanting processes and success for transplanting actions within the Refuge (MCB Camp Blaz 2023). This conservation measure is a "turnkey" measure; once DON has completed demolition area preparation (as described in Section 2.1.3) and provided the agreed-upon funding for the measure, habitat management would be the responsibility of the Refuge. This means the Refuge would be responsible for implementation, compliance, and success of this critical habitat conservation measure as part of its on-going conservation management of the Refuge. As part of the 2020 MOA (see Appendix A), the DON agreed to provide funding to cover the costs of hiring full time equivalents to focus on scientific or biological functions and support the continued habitat management of the restoration areas.

The PCEs for Mariana fruit bat, Mariana crow, and Guam kingfisher involving specific plant species and forest structure could be impacted. The proposed new construction would impact approximately 10.75 acres of critical habitat (Appendix B). The critical habitat acreage is based on the PCEs and excludes all existing facilities, roads, paved areas, and urban landscaped areas, see Table 3-3.

The Refuge considers the critical habitat impacted by the new construction to be of relatively poorer ecological quality to support listed species as compared with other areas on the Refuge. This is because the critical habitat in the area of the new construction has a reduced amount of the PCEs – fewer foraging, breeding, roosting, nesting and sheltering plant species, increased numbers of invasive plant species, and greater proximity to human presence (T. Mizerek, Refuge Manager, personal communication, 2024). The area does not provide the distance from disturbance that is beneficial to species since it is along a road. The area was also preferred for construction because of the number of invasive plant species and lack of protection from ungulates degrading the native forest quality. The existing DOI facilities proposed to be demolished are not within critical habitat as the area is an "existing facility" with "roads, paved areas, and urban landscaped areas." The critical habitat conservation measure would result in the DON funding and the Refuge protecting and enhancing critical habitat in 5.02 acres (including with invasive plant removal and ungulate protection) while also providing additional outplantings targeted at key PCE needs for each of the three species throughout the Refuge (see Table 3.2-4 for details of the conservation measures benefiting critical habitat and ESA listed species). The continued use of MCB Camp Blaz's successful protocols for transplanting and propagating native species and controlling ungulates to allow habitat regeneration at the Refuge (as described in Section 3.2.2.2 *Vegetation* above) would minimize and help to offset impacts to critical habitat.

Additional acreage of previously disturbed, non-critical habitat within the demolition area (as described in Section 2.1.3) may provide the opportunity for future habitat restoration and regeneration through

Refuge management actions. It is reasonable to expect that at a minimum the site, once enclosed (mesh netting – see Appendix E.1) by the Refuge, would naturally regenerate with vegetation, though active management of invasive plant species may be necessary to promote native habitat with the PCEs needed to be considered critical habitat.

The overall loss of acreage would not significantly impact the PCEs required by the Mariana crow for nesting, as all project areas are already in relatively poor-quality habitat for the species to nest due to existing proximity to roads (within 950 feet). The temporary loss of overall potential habitat could impact the ability of the Refuge to support a Guam kingfisher population by reducing available acreage for sufficient breeding and foraging territory. However, the likelihood of Guam kingfisher reintroduction on Guam within the near future is limited by the abundance of BTS on the island. Therefore, the temporary loss of habitat would not be expected to coincide with any anticipated reintroduction or recovery efforts for the Guam kingfisher on Guam.

Overall, critical habitat would be subjected to a loss of 10.75 acres during construction; 2.9 percent of critical habitat at the Refuge would be permanently impacted. Some PCEs may be slightly or temporarily impacted due to construction timing and the length of time required for enhancement and potential regeneration areas to reach mature growth. While the proposed action is likely to adversely affect critical habitat, considering the small percentage of loss and given the demonstrated success of transplant and propagation of native species on MCB Camp Blaz, the impacts of Alternative 1 construction to critical habitat would be less than significant.

ESA-Listed Species

The 10 ESA-listed species known to occur or that may occur within the ROI and carried forward for analysis include *C. micronesica, T. rotensis, S. nelsonii, D. guamense,* Guam tree snail, fragile tree snail, humped tree snail, Mariana fruit bat, Mariana eight-spot butterfly, and the green turtle. An additional three listed plant species, *B. guamense, H. longipetiolata, T. guamense*, are known to occur within the forest enhancement areas on MCB Camp Blaz, which is proposed as the locations for conservation of listed *Cycas micronesica*. However, these three species would be avoided during transplanting site selection, causing no effect to these species and are not analyzed further in this EA. Conservation measures proposed as part of the action and considered in the effects analysis are included in Table 3.2-4.

ESA-Listed Plants

Permanent impacts to the four ESA-listed plant species could occur from disturbances associated with proposed construction activities. The approach to analysis involves consideration of the affected environment for each species as described in Section 3.2.1.3 in contrast to proposed alterations in all project sites (see Section 2.2) to evaluate potential changes to the species' population or habitat. Also considered are the conservation measures proposed for each plant species as part of the proposed action (Table 3.2-4). The continued use of the MCB Camp Blaz protocols for transplanting and propagating native species and controlling ungulates to allow habitat regeneration at the Refuge would minimize and help to offset impacts to affected species.

Cycas micronesica. There are 80 *C. micronesica* individuals within the new facility focus area and all would likely be directly impacted by construction for the proposed facilities under Alternative 1 (see Figure 3.2-2); an additional 31 individuals have the potential to be impacted in areas for road/utility-realignment, particularly along Highway 3A and east of the new facility construction site along the existing Urunao Road for a total of 111 trees with the potential to be impacted (see Figure 3.2-3)

(Scheuerman and Camacho 2022). Design of the facility and road/utility realignments would seek to avoid locations of the known trees to the extent practicable, and, where trees must be removed, a relocation project is proposed to transplant individual trees into the forest enhancement areas on MCB Camp Blaz. At the request of the Refuge, and to ensure better protection of the transplanted individuals, the DON would use the forest enhancement areas on MCB Camp Blaz as they are fenced, actively managed and ungulate free.

Out of the 95 individuals documented within the project area at the time of the 2021 survey, 69 trees were reported to be in healthy condition (36 trees in good condition, 33 trees in fair condition) (Scheuerman and Camacho 2022). The condition of the 16 trees identified in 2024 surveys was not documented (B. Byamba, Environmental Science Corporation-Pacific, personal communication, April 21, 2024). However, the Refuge has requested that all living *C. micronesica* be replaced regardless of the plant health (i.e. a 1:1 ratio of transplant required for all individuals alive at the time of assessment). Due to declining populations from the pressure of the Asian cycad scale, tree health conditions are subject to change and the total trees subject to transplanting would be reassessed prior to construction (see Table 3.2-4 for transplant protocol) (NAVFAC Pacific 2024b). The DON would salvage propagules from the project area, followed by transplant, maintenance, and monitoring at the forest enhancement areas. To determine the number of trees required to ensure success of this effort, the protocol would take into consideration transplant success rate and survival rate under maintained conditions. As of 2023, a 79% survival rate was documented for the *C. micronesica* in MCB Camp Blaz custody within forest enhancement areas (MCB Camp Blaz 2023). As part of INRMP implementation, the protocol would ensure that in 20 years, the number of surviving translocated individuals would be equal to or exceed the likely number of individuals that would have naturally survived in the absence of the project. The conservation measures detailed in Table 3.2-4 further describe this translocation process and would minimize the impacts of the proposed action on *C. micronesica*; however, due to the adverse direct impacts from Alternative 1, the proposed action is likely to adversely affect the species but would be less than significant.

Tabernaemontana rotensis. There are two known populations of *T. rotensis* within the ROI (Scheuerman and Camacho 2022) (see Figures 3.2-2 and 3.2-3). Both populations (a total of 23 individuals) would potentially be impacted by the proximity of utility realignment along Highway 3A; however, such disturbance would be designed to avoid direct impact to these known tree locations. For any trees within the two populations that would become more exposed due to utility realignment, appropriate measures described in Table 3.2-4 would be established to protect the existing tree populations. While the proposed action is likely to adversely affect the species, with measures detailed in Table 3.2-4, the impacts of Alternative 1 to *T. rotensis* would be less than significant.

Serianthes nelsonii. One *S. nelsonii* individual in poor condition exists along the southwest perimeter of the existing facilities survey area (see Figure 3.2-4). While the landscaped portions of the area prepared for potential habitat restoration and regeneration would be disturbed to plant native species, no disturbance would occur within the immediate vicinity of the existing *S. nelsonii* tree and therefore, Alternative 1 would have no impact to this species.

Dendrobium guamense. One *D. guamense* individual was observed in 2021 on a host tree branch, above Highway 3A (Scheuerman and Camacho 2022) (see Figure 3.2-2). The plant's location is within the area proposed for utility realignment and potential salvage and transplantation within the MCB Camp Blaz forest enhancement area would be determined based on plant health. As of 2023, a 96% survival rate was documented for the *D. guamense* in MCB Camp Blaz custody within forest enhancement areas

(MCB Camp Blaz 2023). While the proposed action is likely to adversely affect the species, with measures detailed in Table 3.2-4 to preserve the host tree and surrounding vegetation and given demonstrated transplant success within forest enhancement areas, Alternative 1 would have less than significant impact to this species.

ESA-Listed Wildlife

Temporary and/or permanent impacts to the six ESA-listed terrestrial species could occur from disturbances associated with construction activities. Stressors to the species including habitat loss, risk of strike, risk of fallout/light disorientation, and noise disturbance would also apply to special-status species as was described above for non-listed species. Individually relevant impacts on species are further detailed below. The approach to analysis involves consideration of the affected environment for each species as described in Section 3.2.1.3 in contrast to proposed alterations in all project sites (see Section 2.2) to evaluate potential changes for each species as it pertains to all identified stressors.

Tree Snails. A total of 320 Guam tree snails were recorded along or near Jeep Trail Road and Recreational Access Road during the 2021 surveys and one individual along Highway 3A in 2024 surveys (see Figure 3.2-3) (Scheuerman and Camacho 2022; B. Byamba, Environmental Science Corporation-Pacific, personal communication, April 21, 2024). Nineteen Guam tree snails were documented in 2021 within or in near proximity to proposed activities along the existing Jeep Trail Road where it intersects with the Recreational Access Road as well as the proposed turnaround area. There were no observations of tree snails in the areas proposed for facility construction or demolition (Scheuerman and Camacho 2022). In addition, per anecdotal information provided by the Refuge manager, damage from Typhoon Mawar included downed trees in the area inshore from the Recreational Access Road in which snails had been previously documented. The Refuge staff moved over 1,000 snails found on downed vegetation to a new location outside of the proposed construction footprint (T. Mizerek, USFWS and J. Scarborough, DON, personal communication, 2024).

The Jeep Trail Road construction area would introduce a risk of strike for snails that may be in in the area at the time of construction, as the road footprint, fencing, and pedestrian pathway would extend beyond existing conditions and some vegetation removal would be necessary. Tree snails do not have the ability to move quickly or relocate from an area should there be disturbance due to construction, however, tree snails found in this 0.88-acre area represent a minimal number of the total observed in the 2021 surveys (see Figures 3.2-3, 3.2-4, and 3.2-5) (Scheuerman and Camacho 2022). Following demolition, the proposed preparation of the site for potential habitat restoration and regeneration by the Refuge, along with other forest enhancement conservation on the Refuge, would increase suitability of vegetative habitat for tree snails by introducing desired plants and trees typical of tree snail habitat once plants have matured. While the proposed action is likely to adversely affect the Guam tree snail, with minimal vegetation removal proposed within areas containing tree snail observations, and with the measures detailed in Table 3.2-4 to reduce risks to tree snails, the impacts of Alternative 1 construction to tree snails would be less than significant.

Mariana Fruit Bat. While bats are no longer commonly observed at the Refuge, evidence of bat presence is documented within the project area as well as in surrounding areas within the ROI. Construction activities at the new facility site would be approximately 600 feet from any documented bat presence or bat sign, and demolition activities would be approximately 30 feet from documented signs of bat presence (see Figure 3.2-1) (Scheuerman and Camacho 2022).

Mariana fruit bats are largely nocturnal (resting/roosting during the day and most active at night); the species typically roosts with their colony in the same roosting locations, in mature trees (USFWS 2023b). The nearest potential bat colony is approximately five miles east of the ROI (NAVFAC Pacific 2023). Foraging distances for *Pteropus* bats vary greatly and are not well documented for bats at the Refuge, but they are capable of traveling from the closest potential bat colony to forage within the ROI, and documented signs of bat presence in the 2021 survey indicates that they do (Murugavel et al. 2023; Aziz et al. 2021; NAVFAC Pacific 2023; Scheuerman and Camacho 2022). Potential impacts to the species include habitat loss, risk of strike, light disorientation, and noise disturbance.

Impacts to critical habitat for the Mariana fruit bat are analyzed above within Section 3.2.2.2, *Critical Habitat*. A portion of existing critical habitat would be improved with the outplanting and forest enhancement on the Refuge and this potentially suitable habitat would become available to the Mariana fruit bat once establishment of new vegetation and trees reach a mature and/or fruiting stage (see *Critical Habitat* in Section 3.2.2.2). Under Alternative 1, an additional 1.19 acres (non-critical habitat along Highway 3A) of potential roosting and foraging habitat for Mariana fruit bat would be cleared for utility realignment (see Figure 3.2-1) (DON 2015). Some suitable trees for roosting exist within the currently landscaped site preparation area (non-critical habitat); however, none are proposed to be removed or disturbed and bats have not been observed to utilize this area. Construction would occur primarily during daytime hours; nighttime construction would be minimized to the greatest extent possible. Conservation measures for regulation of artificial lighting, as well as those measures designed to reduce negative impacts from airborne particles and risk of strike during construction, would further reduce potential impacts to bats (see Table 3.2-4).

Impacts of noise disturbance could occur for bats which may rest near the ROI during the day, however it is unlikely that bats routinely roost in the ROI as observations of the species are infrequent (NAVFAC Pacific 2023). Noise from nighttime construction could disturb bats foraging in the ROI but is not likely to be significant considering Mariana fruit bats do not echolocate, meaning they do not depend on a quiet soundscape to forage (Jones and Teeling 2006). Instead, they rely primarily on vision and smell to avoid obstacles and locate food sources (Almeida et al. 2014). Fruit bats do rely on sound for vocalized communication with each other and excessive noise or any sort of stress from disturbance can lead to a variety of negative stress responses (Klose et al. 2006; DON 2010). While fruit bat colonies can be very easily disturbed by excessive noise or human presence (sight, smell, and sounds), there are no known bat colonies within the ROI, and resting or foraging bats not at their colony are approachable at relatively close distances (Mildenstein and Boland 2010; SWCA 2012; NAVFAC Pacific 2023). Regarding general noise disturbance, Mariana fruit bats have been reported to vacate an area at peak noise levels above 90 dB (SWCA 2012). As described in Section 3.8, *Noise*, the loudest construction equipment would generate a noise level of 90 dB at 50 feet (with most equipment generating less), which would attenuate to less than 64 dB at 1,000 feet and generate noise levels indistinguishable within the acoustic environment. Bats are not common in the ROI, they do not rely on sound to forage, and are known to roost adjacent to AAFB flight line, suggesting they are adaptable to noise (NAVFAC Pacific 2023). The noise created from proposed construction of facilities, road and utilities improvements, and demolition and preparation areas would be temporary and intermittent. A sufficient amount of suitable habitat exists for the bat within the rest of the Refuge outside the ROI (300+ acres), and within the northern part of Guam, providing alternate opportunities to the construction locations for foraging bats within the area. In addition, the implementation of the conservation measures (see Table 3.2-4) would avoid and minimize any impacts to bats in the unlikely occurrence any are present. Overall, construction noise at the proposed project locations, and for some time after while fruit bats still avoid the area, may have

marginal, temporary, adverse effects on the critical habitat unit serving as a remote foraging and resting location. The construction personnel at the new facility site would increase human presence relative to existing conditions (sight, smell, and sounds) but would be temporary and minimal. While the proposed action is likely to adversely affect the species, with implementation of new suitable habitat, the high mobility/ability for bats to relocate to suitable areas nearby during periods of construction and demolition, and measures detailed in Table 3.2-4, the impacts of Alternative 1 construction to Mariana fruit bats would be less than significant.

Mariana Eight-Spot Butterfly. The proposed action would not impact host plants for the species, and the various regions within the ROI where host plants have been observed collectively create only sparse reproductive habitat for the Mariana eight-spot butterfly (see Figure 3.5-1). The species may traverse through the project area to reach the cliff habitats where host plants exist, as it has been documented that at least one life stage of the species typically occurs where host plants are present (Schreiner and Nafus 1996). Alternative 1 would permanently remove up to 10.94 acres of suitable limestone karst forest habitat for the Mariana eight-spot butterfly, and the proposed action would result in some slight habitat fragmentation (see Table E-1 in Appendix E.2). Proposed activities in the ROI could also pose risk of strike to the species should it traverse the project area. However, because the species and host plants have not been observed within areas proposed for construction, the proposed action is not anticipated to directly impact individuals (Scheuerman and Camacho 2022). Risks to the species due to ant and wasp predation would be reduced by biosecurity measures detailed in Table 3.2-4. As such, occurrences of the species entering the ROI are anticipated to be minimal, and with the implementation of measures listed in Table 3.2-4, Alternative 1 would have less than significant impacts to the Mariana eight-spot butterfly.

Green Turtle. Green turtles have been documented nesting and hauled out on beaches along Ritidian Point at the Refuge (NAVFAC Marianas 2013; NAVFAC Pacific 2013). Potential haul out and nesting habitat is within 900 feet of the nearest proposed facility construction site, within 100 feet or less of the Jeep Trail Road improvements, and within 200 feet of the proposed demolition area. Habitat loss is not an anticipated stressor to sea turtles under Alternative 1, as no activities are proposed to occur on or near the beaches.

Noise disturbance to sea turtles could occur if ambient noise is exceeded within approximately 150 feet of the animal; however, information regarding exact noise disturbance thresholds of turtles on land is limited (National Oceanic and Atmospheric Administration 2023). The loudest construction equipment would generate a noise level of 90 dB at 50 feet (with most equipment generating less), which would attenuate to less than 64 dB at 1,000 feet and generate noise levels indistinguishable within the acoustic environment. At 900 feet, facility construction would be sufficiently removed from where sea turtles would potentially haul out, thus, construction noise levels at the facility construction site would have less than significant impacts to sea turtles. The facilities proposed for demolition (within 200 feet of a recorded observation) and improvements to the Jeep Trail Road (within 700 feet of a recorded observation) would occur near known and potential haul out locations for sea turtles. However, morphological investigations demonstrated that sea turtles have poor auditory receptors to airborne sound, with limited on-land hearing for low frequencies typically produced by ground construction (Piniak et al. 2016; Popper et al. 2014; Bartol and Ketten 2006). Therefore, airborne noise is not anticipated to disturb green turtles as potentially loud noise levels would attenuate by the time sound would reach a green turtle on the beach and hearing sensitivity is limited on land. Sea turtles in the water would not experience a change in type or magnitude of noise levels from construction,

demolition, or Jeep Trail Road improvement activities (see Section 3.1, *Marine Biological Resources*) (University of Rhode Island and Inner Space Center 2023).

All necessary night lighting during construction activities and post-construction lighting at the proposed new facilities would follow conservation measures to ensure artificial lights are not visible from the beach which may deter or disorient sea turtles from normal behaviors (USFWS 2023c). Additionally, colors of lights used would be limited to 600+ nanometer wavelength (yellow, orange, and red) with avoidance of blue and white lights (Witherington and Bjorndal 1991) (see Table 3.2-4).

Due to the temporary nature of construction, demolition, and Jeep Trail Road improvements, combined with the appropriate conservation measures in Table 3.2-4, Alternative 1 would not result in a sea turtle's behavioral patterns being abandoned or significantly altered. As discussed in marine biological resources (see Section 3.1, *Scope of Analysis*), there is negligible impact of potential contaminated runoff due to the distance of construction from the beach, the highly vegetated nature of the land between the new facilities and the beach, and the implementation of avoidance and minimization measures (Table 3.2-4). With measures detailed in Table 3.2-4, the impacts of Alternative 1 construction to sea turtles would be less than significant.

Table 3.2-4 Proposed Avoidance and Minimization Measures for Terrestrial Biological Resources

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Adherence	General	DON would ensure that all activities occur as described in the proposed action.	All Project Components
Project Function Efficiency	General	DON would minimize impacts to listed species and critical habitat by consolidating functions to the maximum extent practicable in project design and development, while meeting the needs of the Refuge and USGS.	All Project Components
Lighting	Minimize bird/bat/turtle disorientation/ fallout and noise disturbance	Minimize nighttime lighting in demolition and construction sites. Outside area lighting would be fully shielded to avoid impacts to sensitive species, meeting UFC 3-530-01 ratings to reduce illumination of sensitive habitats within the Refuge. Minimize, to the maximum extent practicable, the use of all lighting so that light is not visible from the beach. Additionally, colors of lights used would be limited to wavelengths in the yellow, orange, and red spectrum with avoidance of blue and white lights.	Construction and Demolition
Construction Personnel Education	Minimize impacts to protected species	Prior to the start of construction, construction personnel working at the project site would be provided with information about general avoidance and minimization measures related to invasive species and biosecurity, and the listed species that may occur in the work areas. They would be required to attend a natural resources training program focused on federally listed species conducted by a qualified biologist.	Construction and Demolition

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Pre-Construction Monitoring for ESA-listed Wildlife	Minimize potential impacts to ESA-listed wildlife species	A qualified biologist (See Appendix E.1 for qualifications) would conduct pre-construction/demolition visual surveys to determine if ESA-listed wildlife species are present at a project site prior to beginning work each day. The qualified biologist would also survey the construction and demolition project footprints and a 10-meter buffer prior to the start of construction or demolition activities to map the locations of all threatened and endangered species including home/host plant locations. The purpose of the survey is to get an accurate count of the number of salvageable threatened or endangered species and to allow for collection of the threatened or endangered species for transplant (plants) or translocation (animals). Species-specific measures are as follows: • Training for construction personnel to identify Mariana fruit bats and conduct visual observations of the project footprint at the start of each day. If Mariana fruit bats are observed prior to the start of work within 100 meters, work would be postponed until the Mariana fruit bat has left the area of its own volition. If bat(s) enter the project footprint after the start of work, work would continue. • Vegetation to be trimmed, cleared, or pruned would be inspected to confirm the plant does not contain tree snails. If a tree snail is found, it would be translocated away from the project footprint and into suitable habitat (USFWS 2017). • If any life stage of the Mariana eight spot butterfly (e.g., eggs, caterpillar, or chrysalis) is located within a project footprint during pre-construction surveys, it would be relocated onto an appropriate host plant (e.g., relocate pre-diapause larvae to *P. pedunculata* or *E. calcareum*) within similar sites away from the project footprint.	Construction and Demolition

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Pre-Construction Monitoring for ESA-listed Plants	Minimize potential impacts to ESA-listed plant species	A qualified biologist would perform a pre-construction visual survey to identify any ESA-listed plant species within project sites prior to beginning vegetative clearing. Species-specific measures are as follows: • To the maximum extent practicable, healthy ESA-listed plants located within a project footprint requiring vegetative clearing would be transplanted into suitable protected areas or to the forest enhancement area at Camp Blaz prior to clearing. The ability to salvage the plants would be dependent on the health of the plant and its likelihood of surviving transplantation. • Where ESA-listed plants do not need to be cleared and may not necessarily require transplanting, the qualified biologist would identify listed plant species to aid personnel in identification and avoidance (e.g., both clusters of *T. rotensis*).	Construction and Demolition
Pre-Construction Monitoring for Host Plants – Mariana eight-spot butterfly	Minimize habitat loss for Mariana eight-spot butterfly	During pre-construction visual surveys within project sites prior to beginning vegetative clearing, a qualified biologist would identify host plant species (*P. pedunculata* and *E. calcareum)* for the Mariana eight-spot butterfly, and its various life stages, with flagging attached to adjacent non-listed plants to aid personnel in identification and avoidance or would salvage and translocate the host plants to the maximum extent practicable.	Construction
Snail Habitat Protection	Minimize impacts on Guam tree snails	• A qualified biologist would coordinate with the construction crews to ensure any observed Guam tree snails are avoided or are translocated prior to work commencing. • A qualified biologist would inspect vegetation to be removed to confirm the plant does not contain a Guam tree snail. If a snail is found, the snail(s) would be collected by a qualified biologist with experience handling tree snails and translocated to a suitable site on the Refuge. The DON would coordinate with the Refuge in advance to identify potential snail translocation site(s). • DON would conduct surveys of potential translocation sites. Tree snails may be relocated to more than one site after considering the total number of tree snails to be translocated, potential for human disturbance, flatworm presence, home tree abundance, and general canopy cover.	Construction
Use of Native Plants in Landscaping	Avoid introduction of non-native and invasive species	• Appropriate native and culturally important species would be planted in all new landscapes upon completion of proposed construction activities. Plants to be used would be selected from a list of recommended and approved plants in accordance with relevant guidelines.	Construction

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Cycad Transplanting	Minimize loss of healthy *C. micronesica* individuals	• As the construction designs are finalized, the number of salvageable *C. micronesica* would be determined by the qualified biologist. This "x" number would be used to determine the number of plants needed to offset the impacts of the action. • Design of the facility and road/utility realignments would avoid locations of the known trees to the extent practicable; however, where trees must be removed, individual healthy trees would be transplanted into an undisturbed area within the Refuge. • If a *C. micronesica* plant is located within a project footprint during pre-construction surveys, the plant would be evaluated to determine if the plant or parts of the plant are healthy and suitable for salvage and transplantation. A plant must be considered "salvageable" to be suitable for salvage and transplantation. A qualified biologist would make the determination of the plant health using the Health Assessment Criteria Worksheet (Appendix E.1). • Seeds and cuttings may be collected from individuals outside the project footprint, but within the Refuge; however, no more than ten percent of any individual plant's seeds would be collected. • During transplant, to the maximum extent possible, propagated plants from the same genetically unique individual (i.e., a stem and pup from the same parent tree) would be planted the maximum distance apart allowed by the planting arrangement. • After transplanting the *C. micronesica* would be subject to an annual treatment with a slow release imidacloprid insecticide to treat cycad *Aulacaspis* scale for a duration of five years. • After transplanting, 12 months of maintenance would be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species would be removed within a 20-foot (6-meter) radius around transplants.	Construction and Site Preparation

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
		• Transplanted *C. micronesica* would be considered living/surviving when they show: full crown development, no visible sign of nutrient deficiencies, and no visible sign of stem rot/decay. Photographs would be taken annually to document full crown development, lack of nutrient deficiencies and no visible signs of stem rot/decay. To maintain the number of cycads that would be expected to occur 20 years from the start of vegetation clearing, the project would salvage or propagate a sufficient number of cycads based on a 5.8% annual rate of decline. • Monitoring would continue until the transplants meet the survival criteria. Maintenance would be reduced and eliminated during a hardening-off period and then the plants would be monitored for at least 6 months following cessation of maintenance activities. Following completion of the survival criteria monitoring period, intermittent monitoring as part of INRMP implementation would occur at 5, 10, 15, 19, and 20 years following transplanting. • Identification tags would accompany transplanted *C. micronesica* as well as GPS submeter coordinates for the *C. micronesica* locations as part of INRMP implementation during the 20-year monitoring period.	
Plant Habitat Protection	Minimize loss of *D. guamense*	There is some uncertainty regarding the final project footprint and whether or not the one *D. guamense* within the area proposed for utility realignment would be permanently removed as a result of the action. • If a *D. guamense* plant is located within a project footprint during pre-construction surveys, the plant would be evaluated to determine if the plant is healthy and suitable for salvage and transplantation. A plant must be in good or fair condition to be suitable for salvage and transplantation. A qualified biologist would make the determination of the plant's health. • Salvage of plant material for *D. guamense* would be dependent on salvage work method feasibility (e.g., safety and site-specific conditions) and sufficient plant health to support transplantation survival. • If the whole plant cannot be salvaged DON may collect seeds from healthy plants in the project footprint or within the MCB Camp Blaz forest enhancement areas to propagate and transplant within the forest enhancement areas. The forest enhancement areas are fenced and have had ungulates removed. Any such seed collection or cuttings outside the project footprint would entail collection of no more than ten percent of any individual plant's seeds.	
			Construction

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
		• Identification tags would accompany transplanted *D. guamense* as well as GPS submeter coordinates for the *D. guamense* locations. • After transplanting, up to 12 months of maintenance would be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species would be removed within a 20-foot (6-meter) radius around transplants. • Monitoring will continue until the transplants meet the establishment criteria described below. Maintenance would be reduced and eliminated during a hardening-off period and then the plants would be monitored for at least 6 months following cessation of maintenance activities. • Plants would be monitored until they are considered established. • Transplanted *D. guamense* would be considered established when they flower and set seed and there are no visible signs of nutrient deficiencies. • Following completion of the establishment period, intermittent monitoring as part of INRMP implementation would occur at 5 and 10 years following transplanting.	
Plant Habitat Protection	Minimize loss of *S. nelsonii*	No disturbance from construction, demolition, or site preparation would occur within the immediate vicinity of these plant species.	Construction
Plant Habitat Protection	Minimize loss of *T. rotensis*	There is some uncertainty regarding the final project footprint and whether or not the two populations (23 individuals) of *T. rotensis* within the utility realignment along Highway 3A would be permanently removed as a result of the action. No direct impacts to *T. rotensis* are anticipated. If a *T. rotensis* is located within a project footprint during pre-construction surveys, the plant would be evaluated to determine if the plant or parts of the plant are healthy and suitable for salvage and transplantation. A qualified biologist would make the determination of the plant's health. • Salvage of plant material for *T. rotensis* would be dependent on salvage work method feasibility (e.g., safety and site-specific conditions) and sufficient plant health to support transplantation survival.	
			Construction

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
		• The preferred method of plant propagation is seed collection and cuttings. Seeds and cuttings collected for this propagation activity would come from wild plants growing within the construction footprint (if available); any such seed and cutting collection outside the construction footprint would entail collection of no more than ten percent of any individual plant's seeds or plant parts. • The number of plants that are replaced would be equal to or greater than the number that are directly impacted. The transplant location is dependent on the location of the plant. If the impacted plant is on DoD property, it would be transplanted to MCB Camp Blaz. If the impacted plant is on the Refuge, it would be transplanted on the Refuge. Transplants would be planted either within the forest enhancement areas on MCB Camp Blaz (approximately 19 plants) or the Refuge (approximately four plants). • Identification tags would accompany transplanted *T. rotensis* as well as GPS submeter coordinates for the *T. rotensis* locations. • After transplanting, up to 12 months of maintenance would be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species would be removed within a 20-foot (6-meter) radius around transplants. • Monitoring would continue until the transplants meet the establishment criteria described below. Maintenance would be reduced and eliminated during a hardening-off period and then the plants would be monitored for at least 6 months following cessation of maintenance activities. • Plants would be monitored until they are considered established. • Transplanted *T. rotensis* would be considered established when they show full crown development and show no visible sign of nutrient deficiencies. Photographs would be taken annually to document full crown development, reproductive structures, and lack of nutrient deficiencies. • Following completion of the establishment period, intermittent monitoring would occur as part of INRMP implementation at 5 and 10 years following transplanting.	

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Critical Habitat Protection	Minimize impacts to critical habitat	• DON would demolish the existing DOI facilities, remove demolition debris, and prepare the site for potential habitat restoration and regeneration. The demolition of the existing DOI facilities would leave approximately 1.42 acres of cleared area for potential habitat restoration and regeneration. • The DON would fund the Refuge to undertake the collection and outplanting of identified and prioritized plant species used for foraging, rearing, roosting, sheltering and nesting by the Mariana fruit bat, Mariana crow and Guam kingfisher to several focal areas (including the demolition area, if suitable after demolition) and across the Refuge where appropriate. This measure would minimize the construction impacts on critical habitat by providing protection from ungulates and enhancement of critical habitat in areas already demonstrating the appropriate substrate and microclimate to support outplantings. • DON would fund the Refuge to collect plant material, propagate, outplant and maintain these specific plant species for the benefit of the Mariana fruit bat, Mariana crow, and Guam kingfisher in areas selected by the Refuge. • The Refuge would target the outplanting and maintaining of sufficient plants to ensure that 488 genetically unique individuals of 15 different identified and prioritized native species would achieve fruiting twice. • Five areas would be netted to exclude ungulates for conservation benefit. The management actions within the netted areas would vary based on current habitat quality, substrate and access. • This conservation measure is a “turnkey” measure such that once DON has completed demolition area preparation and provided the agreed-upon funding for the measure, habitat management would be the responsibility of the Refuge. This means the Refuge would be responsible for implementation, compliance, and success of conservation measures associated with critical habitat as part of its on-going conservation management of the Refuge. All monitoring reports for this conservation measure would be prepared by the Refuge and provided to DON for submission to the USFWS in accordance with the Biological Opinion.	Demolition and Site Preparation
Plant Protection	Minimize loss of protected species	Any plant material collected on the Refuge for the purposes of propagation outside of the construction footprint must be coordinated with and approved by Refuge.	All Project Components

Avoidance and Minimization Measure	*Impacts Reduced/Avoided*	*Description*	*Applicability*
Biosecurity	Minimize introduction of non-native species to Guam or inadvertent spread to other locations from Guam	Develop a HACCP Plan, which would identify risks and potential pathways for non-native species and would outline procedures for controlling and removing risks identified. The plan would require inspections and proper re-use or disposal of vegetation to avoid contributing to the further spread of non-native species.	Construction and Site Preparation
Erosion Control Plan	Biological resources and water resources effects	Prepare an Erosion Control Plan and comply with all required clearing, grading, and stockpiling permits issued by Guam Environmental Protection Agency for facility construction, utility realignments, and demolition.	Construction
Erosion Control	Biological resources and water resources effects	Reduce the potential for soil, sediment, and pollutants to be transported off site through use of erosion socks, runoff detention basins, silt fencing, and drainage features (e.g., prevent ponding, divert direct stormwater flow away from construction sites, etc.).	Construction
Stormwater Control	Avoid increased water on beaches to reduce impact on Green turtles	No new or existing increases of any concentrated flow. Permanent stormwater design features for this project would be designed per the 2006 CNMI and Guam Stormwater Manual. The NPDES Program Comprehensive Construction Storm Water Pollution Prevention Plan (Comprehensive SWPPP) for the Guam Military Relocation DPRI Construction Program dated Nov 2014 is a guidance document intended to aid construction contractors as they prepare the project-specific SWPPP.	Construction
Dust Suppression	Air emissions particulates, biological resources	Conduct regular watering during ground-disturbing construction activities to reduce negative impacts from airborne particles during construction.	Construction

Legend: DoD = Department of Defense; DOI = Department of the Interior; DON = Department of the Navy; ESA = Endangered Species Act; GPS = Global Positioning System; HACCP = Hazard Analysis and Critical Control Point; MCB = Marine Corps Base; NPDES = National Pollutant Discharge Elimination System; SWPPP = Stormwater Pollution Prevention Plan; UFC = Unified Facilities Criteria; USFWS = United States Fish and Wildlife Service; USGS = United States Geological Survey.

3.2.2.3 Alternative 2

Proposed action impacts under Alternative 2 would be identical to those described in Section 3.2.2.2 for Alternative 1, with the only changes being: the total project area totaling 19.46 acres under Alternative 2, compared to 22.46 under Alternative 1; the critical habitat to be cleared totaling 7.75 acres under Alternative 2, compared to 10.75 acres under Alternative 1; and the construction impact footprint for the replacement facility totaling 4.51 acres under Alternative 2, compared to 7.51 acres under Alternative 1. Alternative 2 would result in a marginal but less than significant increase in impacts to wildlife from artificial lighting due to the second story design potentially exceeding the height of surrounding vegetation, which may reduce lighting in the environment that is not fully blocked from the installation of UFC 3-530-01 light standards. Under Alternative 2, impacts to vegetation, wildlife, and special-status species would be identical to those described in Section 3.2.2.2, but with a smaller loss of potential habitat occurring over an approximately 4.51-acre area of undeveloped limestone karst forest. Regarding special-status species within the 4.51-acre footprint, fewer cycad trees are expected to be impacted by construction of the proposed replacement facility, with the exact number of trees impacted dependent on the final location of the 4.51-acre footprint. Therefore, impacts to vegetation, wildlife, and ESA-listed species under Alternative 2 would be less than significant.

3.2.2.4 ESA Section 7

The Marine Corps conducted formal consultation with USFWS under Section 7 of the ESA for the proposed action's potential impacts to ESA-listed species and critical habitat (see Appendix E.1 for correspondence). Species included in the formal consultation include *C. micronesica, T. rotensis, S. nelsonii, D. guamense*, Guam tree snail, fragile tree snail, humped tree snail, Mariana fruit bat, Mariana eight-spot butterfly, and the green turtle. The Marine Corps determination is that Alternative 1 would be likely to adversely affect *Cycas micronesica, Dendrobium guamense*, *Tabernaemontana rotensis,* Guam tree snails, Mariana fruit bats, and critical habitat for the Mariana fruit bat, Guam kingfisher, and the Mariana crow, and may affect but not likely to adversely affect green turtles, Mariana eight-spot butterfly, humped tree snails, fragile tree snails, and *Serianthes nelsonii* (see Appendix E.1). The USFWS concurrence on this determination is pending and will be based on their analysis and decision on the Biological Assessment (NAVFAC Pacific 2024b) and other pertinent data.

3.3 Cultural Resources

Cultural resources encompass human history, including archaeological sites, historic buildings, ethnographic resources, traditional cultural properties, and cultural landscapes. Under the NHPA, Section 106 requires a consultative process for federal agencies to identify and assess the effects of its undertaking on cultural resources, and Section 110 requires federal agencies to establish preservation programs for the identification, evaluation, and preservation of historic properties. Cultural resources consist of historic properties eligible for the National Register of Historic Places (NRHP) and those cultural resources defined more broadly. Cultural resources consist of the following four categories:

- **Archaeological Resources**: Those areas or locations (sites) where human activity measurably altered the earth or left deposits of physical remains, such as latte or pottery.
- **Architectural Resources or Built Properties**: Those standing buildings, dams, canals, bridges, and other structures which have historic, engineering, or aesthetic significance.
- **Traditional cultural properties** (properties of traditional and cultural importance) can include a building, structure, object, site, or district that is eligible for inclusion in the NRHP because of its

association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

- **Resources of cultural importance** are important traditional activities and practices such as hunting, gathering, farming, medicinal, and fishing practices.

The ROI for this analysis of impacts to cultural resources under NEPA is equivalent to Section 106's area of potential effects (APE). The APE encompasses new construction; staging areas; building demolitions; and the locations of where new buildings or structures could potentially detract from the integrity of the setting and feeling of cultural resources through visual, audible (noise), or atmospheric changes.

Under the NHPA, a historic property is a particular type of cultural resource defined as a district, site, building, structure, or object that meets the specific criteria of the NRHP. Under NEPA, the consideration of cultural resources may also include non-NHPA eligible resources such as cemeteries, memorials, medicinal plants, and similar resources that hold special traditional, religious, or cultural significance.

JRM entered into a PA with the GSHPO and other signatories in 2011 that applies to this proposed action. The USFWS designated the DON as lead agency to fulfill the collective responsibilities of both agencies under Section 106 of the NHPA for this action. MCB Camp Blaz is responsible for complying with the terms of the PA and the lead agency requirements on behalf of JRM. The PA establishes a process for the review and analysis of potential effects to historic properties and other cultural resources for all aspects of the Marine Corps relocation, including this proposed relocation of DOI facilities. In accordance with the PA, the Marine Corps is consulting with the GSHPO, interested parties, and the public regarding the proposed undertaking (see Appendix D).

3.3.1 Affected Environment

3.3.1.1 Archaeological Resources

In August 2022, the DON completed a Phase I archaeological subsurface and surface survey (Dixon et al. 2023) in preparation for the current proposed action, surveying a total of 17.48 acres in the proposed new facility and road improvement areas within the APE where ground-disturbing activities are proposed. The proposed demolition area and potential habitat restoration and regeneration area has been partially surveyed, which identified both disturbed and significant resources. The DON is consulting with the GSHPO on the results of the recent survey.

Table 3.3-1 lists three known archaeological sites located within the APE for the proposed action. Two sites are NRHP-eligible and one site, a disturbed Latte Period ceramic scatter, is not NRHP-eligible. The Ritidian Site (66-08-0012) is an extensive complex site that dates to the Latte, Spanish Missionization/Chamorro Spanish Wars, Post-World War II/Second American Territorial, Organic Act/Home Rule/Economic Development Period. The Latte Period features include a latte set (Feature A), disturbed latte components (Features B, L, and N), a cave with pictographs (Feature C), a grotto cave (Feature G) and an artifact scatter covering the entire site area (Feature J). Historic features include the subsurface foundation of a Spanish church known as Casa Real (Feature D) dating to the Spanish Missionization Period/Chamorro Spanish Wars (Anno Domini [A.D.] 1668 to 1700) period; a Post-World War II/Second American Territorial Period (A.D. 1944 to 1950) concrete foundations (Features E and K); Organic Act/Home Rule/Economic Development Period antenna anchors/bases (Feature I); and a Post-World War II/Second American Territorial Period (A.D. 1944 to 1950) water pump engine. Ten additional cave sites have been documented with most containing Latte Period rock art as recorded by Carson

(2014, 2016, 2022) and Jalandoni (2011). Star Cave is located along the proposed fence line and Passage and Trail Shelter Caves are located on both sides of the former ramp and the proposed access road. The Lower, Unnamed, and Upper Caves are located in the cliff line below the proposed construction area on the first terrace above. No information is available for West End Cave toward the southern boundary of site 66-08-0012. The site is 411,920 square meters in size and was nominated for the NRHP in 1979. As a historically documented Spanish Missionization/Chamorro Spanish Wars Period village with a Spanish church, latte set habitations, utilized caves, surface ceramics and tools, and excavated subsurface materials, the site is associated with events that have made a significant contribution to the broad patterns of history (NRHP Criterion A). It is also likely to yield information important in history or prehistory beyond that already recorded (NRHP Criterion D). Therefore, the site has been recommended as eligible for listing in the NRHP under Criteria A and D (Dixon et al. 2015).

Table 3.3-1 Archaeological Sites within the Proposed Action APE

GHPI Number	*Site Type*	*Period*	*Reference*	*NRHP Eligible?*	*NRHP Criteria*
66-08-0012	Ritidian Site Complex	Latte, Spanish Missionization/Chamorro Spanish Wars, Post-World War II/Second American Territorial, Organic Act/Home Rule/Economic Development	Reinman 1977; Kurashina et al. 1990; Dixon 2000; Bayman et al. 2010, 2012; Jalandoni 2011; Carson 2014; Carson et al. 2014; Carson et al. 2015; Dixon et al. 2015; Carson 2017a, b; Carson 2022	Yes	A, D
66-08-2744	Ceramic scatter	Latte	Dixon et al. 2015	No	N/A
Temp Site 1	6 stone features	Unknown	Dixon et al. 2023	Yes	D^

Note: ^The DON is consulting with the GSHPO on the eligibility.
Sources: Dixon and Nelson 2022a, 2022b; Dixon et al. 2023.

Dixon et al. (2015) recorded Site 66-08-2744 as Latte Period A.D. 800 to 1521, a ceramic scatter. As a small, eroded Latte Period ceramic scatter with few artifacts and no in situ subsurface materials detected during shovel testing, it will not yield information important to history or prehistory under NRHP Criterion D, and, as such, the DON recommended this site as not eligible for listing in the NRHP.

One new archaeological site and three isolated finds located within shovel test pits and outside of the previously recorded site boundaries were recorded during the 2022 survey. The newly recorded site (field number Temp Site 1) consists of six stone features with no associated artifacts. The age of the site is unknown but includes similar feature types from other archaeological sites on Guam that likely relate to post-Contact or historic native forest exploitation. The site has been recommended as eligible for listing in the NRHP because it maintains its historic integrity and may yield information important in history or prehistory (NRHP Criterion D). The DON, as designated Lead Agency, in coordination with USFWS, is consulting with the GSHPO regarding the site's NRHP eligibility. In addition, the Ritidian Site (66-08-0012) was updated to include three new features within the site boundary (Dixon et al. 2023).

A total of 26 un-thickened rim sherds were found within two shovel test pit transects within site 66-08-0012, along the existing jeep trail and a much lower number within the transect along Recreational Access Road (see Figure 2-1). Also present in the same deposits were a few cord-marked and circle-impressed ceramics, some with calcareous temper, and marine shell ornaments, including fragments of

a Cypraeidae incised grater or octopus lure that are diagnostic of Late Pre-Latte Period occupation dating to approximately 1100 B.C. to A.D. 100 (Dixon et al. 2023).

3.3.1.2 Architectural Resources

An architectural survey was conducted in 2012 within the Refuge to inventory all buildings including the main office/administration building (Building 800 [66-08-2754]), a maintenance building (Building 801 [66-08-2755]), and the Nature Center (Building 803 [66-08-2756]) (Dixon et al. 2015). These buildings were built in 1968 as part of a Sound Surveillance System during the Cold War. Sound Surveillance System facilities were responsible for underwater monitoring of Soviet submarines. The three buildings were evaluated under NRHP Criteria A, B, C, and D. Each building was directly associated with the same unique event during the Cold War and was evaluated per NRHP Criteria Consideration G for exceptional importance. The buildings were found to not retain historic integrity sufficient to meet NRHP eligibility and were not recommended as eligible for listing in the NRHP. The GSHPO concurred with this recommendation (GSHPO correspondence dated September 17, 2014 [RC2013-0853]). As a result, there are no NRHP-eligible or listed architectural resources within the APE of the proposed action.

3.3.1.3 Traditional Cultural Properties

No NRHP-eligible traditional cultural properties are located within the APE (Griffin et al. 2010).

3.3.1.4 Resources of Cultural Importance

Today, many CHamorus and members of the local community on Guam recognize rock art images, located in caves in the Refuge, to be unifying symbols that are a fundamental part of their modern cultural identity – much as the *latte* stones. Many CHamoru inhabitants consider Ritidian (located within the Refuge) “a sacred space where the stories of Guam’s oldest ancestors can be experienced” (Carson 2018:12). CHamoru people visit specific cultural resources within the Refuge to maintain a connection to their history and culture.

3.3.2 Environmental Consequences

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

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

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

3.3.2.1 No-Action Alternative

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

3.3.2.2 Alternative 1

Archaeological Resources

The APE for Alternative 1 contains two known NRHP-eligible archaeological sites (66-08-0012 and Temp Site 1). Physical impacts including excavation, soil removal, and vibrations from heavy machinery associated with construction with the new facilities, road improvements, and utility realignments along the roads could potentially cause direct, adverse effects to the two known NRHP-eligible archaeological sites. However, the Marine Corps would minimize adverse effects through avoidance and minimization measures (see Section 2.4) including site design and planning, and then mitigate unavoidable adverse effects in accordance with the 2011 PA.

Human skeletal remains have been previously found on the Refuge. If human skeletal remains were found during the construction and demolition of the USFWS facilities and subsequent preparation of the site for potential habitat restoration and regeneration, the DON would consult with the GSHPO. As noted in Stipulation VI.F of the 2011 PA, a DON Archaeologist would provide site checks, oversee coordination and execution of the archaeological mitigation measures, and provide quality control.

The road improvements would help in the access and management of cultural resources on the western side of the Refuge.

Architectural Resources

There are no NRHP-eligible or listed architectural resources within the APE; therefore, there are no impacts to architectural resources.

Traditional Cultural Properties

No NRHP-eligible traditional cultural properties are located within the APE; therefore, there are no impacts to the traditional cultural properties.

Resources of Cultural Importance

CHamoru people wanting to visit specific cultural sites, including the caves, located within the Refuge so they can maintain a connection to their history and culture will be impacted by construction activities. However, closures of the Refuge or portions of the Refuge due to construction activities may occur, but disrupted access to these areas would be temporary and intermittent**.** See Section 3.4, Recreation, for more impact discussion regarding access to these caves located within the Refuge.

The Marine Corps would minimize adverse effects through avoidance and minimization measures including site design and planning (see Section 2.4) and then mitigate unavoidable adverse effects in accordance with the 2011 PA. This would result in less than significant impacts to cultural resources.

Closures of the Refuge or portions of the Refuge due to construction activities may occur, but disrupted access to these areas would be temporary and intermittent. For these reasons, Alternative 1 would result in less than significant impacts to cultural resources.

3.3.2.3 Alternative 2

Construction, demolition, and site preparation impacts under Alternative 2 would be similar to those described in Section 3.3.2.2 for Alternative 1, with the exception of a reduced construction impact footprint for the DOI replacement facilities from 7.51 acres to 4.51 acres. All other areas affected by proposed road improvements, utility realignment, construction laydown area, and facility demolition and site preparation would be the same for Alternative 2 as for Alternative 1. The Marine Corps would minimize adverse effects through avoidance and minimization measures including site design and planning, and then mitigate unavoidable adverse effects in accordance with the 2011 PA; therefore, there would be less than significant impacts to cultural resources under Alternative 2.

3.4 Recreation

Recreation at the Refuge are outdoor activities that are appropriate and compatible with current Refuge use. The ROI for recreation is the Refuge.

3.4.1 Affected Environment

Ritidian Point, the northernmost tip of the island, is a popular recreation area and scenic viewpoint. Table 3.4-1 provides a summary of public access to recreational resources, and Figure 3.4-1 identifies recreational resources at and near the Refuge (DON 2015). The 2009 Guam National Wildlife Refuge Comprehensive Conservation Plan (Guam National Wildlife Refuge and USFWS 2009) identifies recreational opportunities in the Refuge including a nature center; wildlife observation areas; self-guided hikes; guided cave, cultural and forest tours; limited fishing; cultural resource interpretation; and environmental education. Public recreational activities are currently allowed on approximately 120 acres west of the existing USFWS facilities (USFWS 2009). When the Refuge is open (Wednesday to Sunday, 7:30 a.m. to 4:00 p.m. [USFWS 2023d]), the public may hike, picnic, sightsee, and explore the Nature Center, or swim, snorkel, and scuba dive in the offshore waters. Admission to the Nature Center is free. The USFWS also operates environmental education programs for Guam students.

Table 3.4-1 Recreational Resources within the Refuge

Recreational Resource	*Public Access (Wed–Sun 7:30 a.m.–4:00 p.m.)*
Day Use Sites for families and individuals	Limited day use sites open to the public
Shoreline Pole and Line Fishing	Open to the public
Ritidian Beach - Swimming and Snorkeling	Open to the public
Natural Areas –Cave Sites	Open to the public
Hiking Trails	Open to the public
Scenic Viewpoint at Ritidian Beach	Open to the public
USFWS Nature Center	Open to the public
Cultural Sites	Open to the public

Legend: USFWS = United States Fish and Wildlife Service.
Source: DON 2015.

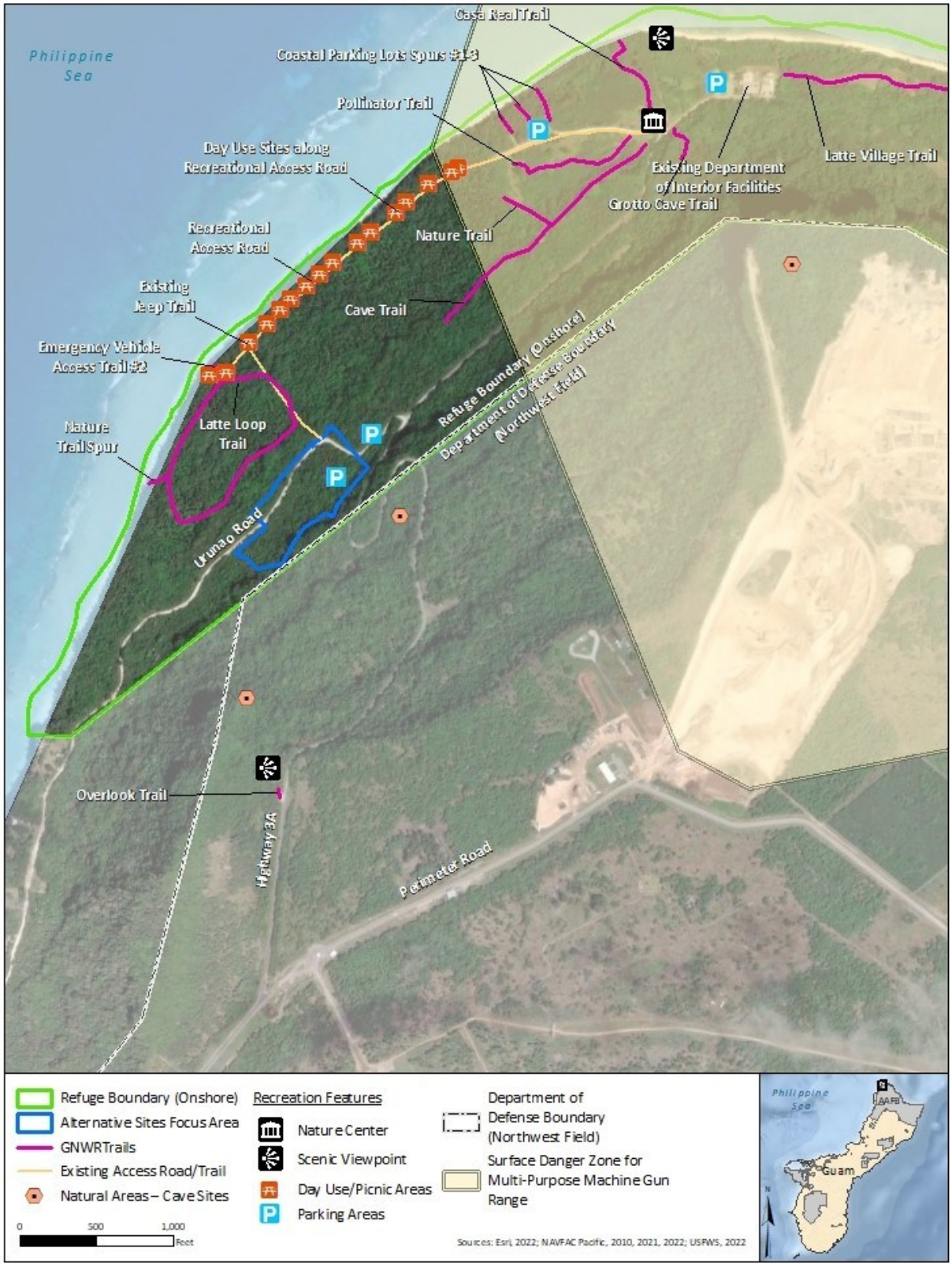


Figure 3.4-1 Recreational Resources in the Project Area

The Refuge provides paved parking at the Nature Center, individual parking spaces at day use sites along the beach, and unimproved parking within walking distance of the beach area (approximately 150 yards along segmented foot path from beach access parking to beach). Self-guided and guided hiking trails allow visitors to observe wildlife and their natural surroundings. Ritidian Beach provides an opportunity for the public to recreate on the beach and in the marine portion of the Refuge and provides access to multiple day use sites for day use along the Recreational Access Road.

When the MPMG Range is in use, the associated SDZ will be activated and public access to that portion of the Refuge will be restricted. It is anticipated such training will be limited during the proposed construction period for the replacement facilities and will be scheduled to avoid conflicts with the Refuge normal operating hours. Thereafter, once DOI has transitioned to the new facilities outside the SDZ, the affected environment for recreation assumes that recreational access to areas within the SDZ will be restricted during MPMG training operations at the range and that advance schedule coordination between the Marine Corps and the DOI would occur per agreements in the 2020 MOA.

3.4.2 Environmental Consequences

3.4.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed replacement of existing DOI facilities would not occur. There would be no public or staff access to the current DOI facilities (including the Nature Center), or the recreational resources located within the SDZ when the MPMG Range SDZ is activated. There would also be no alternate public access to other publicly accessible areas of the Refuge outside the SDZ. While access to the existing DOI facilities would be available when the SDZ is not activated, the DOI's ability to manage the Refuge and achieve the purposes for which the Refuge was established would be severely constrained under such conditions. For these reasons, and as identified in the SEIS, the No-Action Alternative would result in a significant impact to recreation.

3.4.2.2 Alternative 1

Alternative 1 would include construction of the proposed project components in three phases (see Section 2.1.4). Construction of the DOI replacement facilities and realignment of a portion of Urunao Road during Phase 1 would occur in an area of the Refuge not presently used for recreation. Urunao Road does not currently access recreation areas in the Refuge and the jeep trail is currently undeveloped and not visible or accessible from Urunao Road. Access to hiking trails that intersect the jeep trail may be temporarily unavailable during certain phases of construction of the Jeep Trail Road, but access to those trails would continue to be available from other locations. Construction activities to create the improved Jeep Trail Road would not affect visitor access to the beach areas because the current route on Highway 3A toward the existing DOI facilities and connecting to the north end of the Recreational Access Road (see Figure 3.4-1) would remain open during road construction.

During Phase 1, the roads that are used to access recreational resources (Highway 3A and Recreational Access Road) would only be subject to utility realignment and pothole repairs, and therefore would not require road closures. These minor repairs may cause temporary traffic delays as vehicles are detoured around construction, but access to the existing DOI facilities and recreation areas would be maintained.

Upon completion of the proposed improvements to create the Jeep Trail Road, visitors would have alternate access to all recreation areas while the existing DOI facilities are being demolished (Phase 3). Except for intermittent and temporary delays during Phase 1 road improvements, all recreation

activities open to the public during the Refuge's operating hours (including the Nature Center, beach, cultural sites, and educational programs) would be available during proposed construction activities.

Some periodic delays in public access may occur while furnishings, equipment, or supplies are transported between facilities during Phase 2 of the proposed action, and there could potentially be temporary disruptions or reductions in the operating schedule of DOI facilities and public programs during the transition. However, these delays would be intermittent and temporary. Standard traffic control measures would minimize any delays caused by large trucks traveling between the existing and new facilities. All such impacts would be less than significant.

Phase 3 demolition of the existing DOI facilities and preparation of the site for potential habitat restoration and regeneration would occur after opening the new DOI facilities and completing proposed road improvements, and proposed demolition would not include existing roads within the SDZ. Therefore, impacts to recreation in the Refuge during Phase 3 would be limited to only brief infrequent delays due to the presence of construction vehicles.

The proposed new road improvements, parking areas, pedestrian walkway, paved traffic turnaround and drop-off area near the beach, new DOI facilities and Nature Center, and traffic control/signage throughout the proposed action location would create easy and safe access, a smooth transit on the roadway, safe designated walking areas, and an overall enhanced educational experience for the public. This would be the case when the SDZ is activated (by allowing access to the Recreational Access Road and day use sites along the beach that would not otherwise be accessible) and when the SDZ is not activated (by providing supplemental access to publicly accessible areas of the Refuge). The designated pedestrian walkway that would be constructed parallel to the proposed Jeep Trail Road would traverse some changes in topography and elevation. All proposed new access routes and improved roadways would be designed and constructed to building codes, and appropriate safety measures, such as railings, would be installed as necessary to meet all safety requirements for pedestrians. The proposed new facilities would include upgraded utilities, providing more reliable water and electricity at the Refuge. In addition, the proposed Jeep Trail Road improvements and the location of the Nature Center would be closer in proximity to the existing public trails (Latte Loop Trail) than the current public parking areas and Nature Center (see Figure 3.4-1). The Nature Center and parking proximity to the Latte Loop may create a shift in the public's use from the trails closer to the existing facilities to the Latte Loop Trail. However, the new facilities are not anticipated to create an increase in overall visitors to the Refuge. If a shift in public preferred use of the Latte Trail occurs, and over time results in the need for additional management actions by USFWS, adaptive management would be implemented and the USFWS may refer to the MOA V.A.3 to address such impacts (see Section 1.2). Parking areas along Recreational Access Road would not change except for the addition of Americans with Disabilities Act-compliant accessible parking near the proposed new turnaround area at the junction of Recreational Access Road and the new Jeep Trail Road. Pedestrian traffic would have a designated walking path alongside the improved Jeep Trail Road, creating a safer transit from the proposed new facilities to the beach than currently exists from the existing facilities to the beach. Clear signage would provide understandable information to the public, and safety measures such as signs and gates would inform the public of when the area of the Refuge within the SDZ is not accessible.

Whenever the SDZ is not activated, visitors would be able to access day use beach sites along Recreational Access Road from both the southwest (via the improved Urunao Road and Jeep Trail Road) and from the northeast (via Highway 3A near the existing DOI facilities). This would effectively create a complete loop around the publicly accessible portions of the Refuge and represents a beneficial but less

than significant impact to recreation. This new loop would provide visitors with an additional option for accessing recreational opportunities and would improve traffic flow on the Refuge. No changes in parking conditions along Recreational Access Road or in the average number of visitors to the Refuge are anticipated. All day use sites would remain available for recreational use when the SDZ is not active. The proposed DOI facilities would be outside the SDZ, providing the public with access to educational opportunities when the Refuge is open, even when the SDZ is active.

Whenever the SDZ is activated, the proposed action would enable continued access to DOI facilities and to recreational resources located outside the SDZ, including all but two of the day use beach sites along Recreational Access Road that would have otherwise been inaccessible under such conditions without the proposed action.

For reasons described above, Alternative 1 would result in adverse but less than significant impacts from short term and temporary construction delays or detours during early phases of project implementation. In later phases of implementation after new facility construction and road improvements are completed, Alternative 1 would result in beneficial but less than significant impacts to recreation by providing additional access options within the Refuge, including during periods when the SDZ is activated and when it is not activated.

3.4.2.3 Alternative 2

Alternative 2 would feature the same road improvements and alternate access features as Alternative 1 and would, therefore, result in similar beneficial but less than significant impacts to recreational access during and after certain phases of project implementation. The proposed construction activities and construction schedule would be essentially the same as Alternative 1 and would have the same short term, temporary, and less than significant impacts from potential delays and access disruptions during early construction phases. The primary difference between Alternatives 1 and 2 is that under Alternative 2 some of the replacement facilities would be constructed as a two-story structure. Alternative 2 would be a less efficient configuration for conducting USFWS and USGS mission activities. Consolidating operations would diminish visitor experience and reduce accessibility and functionality when split between two levels. To accommodate required elevators and stairwells, there would be less functional square footage for Refuge and USGS administration, operations, research, educational classrooms, and the nature center. From this perspective, Alternative 2 would have more of an adverse impact to recreation than Alternative 1, though these impacts would still be less than significant.

3.5 Visual Resources

Visual resources include scenic areas, vistas or thoroughfares, and locations that provide natural or aesthetically pleasing places or views. In addition, visual resources are recognized as views and vistas that people are accustomed to seeing as a general part of the landscape. The ROI for visual resources includes the western section of the Refuge and the vicinity of Highway 3A.

Key observation points (KOPs) were identified as representative viewing locations of the affected landscape accessible to the public. Views are often described in terms of foreground, middle ground, and background, depending on the site. For analysis purposes, visual resources include dominant landscape features, diversity, visual elements (line, color, form, and texture), and distinctive visual edges and contrast (e.g., a building adjacent to a forested area).

3.5.1 Affected Environment

Topography in the western section of the Refuge changes from steep inclines and cliffs along the eastern edge to generally flat downward to the shoreline. The landscape within the ROI is heavily vegetated with wide-canopy trees and shrubs, making a variety of greens the dominant color. Along the coastline, Ritidian Point provides scenic value. The primary built features within the ROI include the existing DOI facilities, parking areas, roads, and trails. These built features contrast with the mostly naturally appearing environment by adding building mass and height, grey pavement color, and roadway and trail lines throughout the area.

The public can see the Refuge from spots along Highway 3A, Urunao Road, existing trails, and Recreational Access Road. Four KOPs (Figure 3.5-1) were selected as representative sites for visual assessment:

KOP 1 (Photo 3.5-1): Located at a scenic viewpoint at higher elevation near Highway 3A, the public has access to unobstructed views of the vegetated forest as well as the Ritidian coastline and the ocean. Looking northwest from the lookout, this KOP views the project area. Lush green vegetation dominates the foreground and middle ground. A flat limestone plateau and sheer cliff line is visible in the middle ground, with views of ocean waters in the distant background.



Photo 3.5-1 Looking Northwest from the Scenic Viewpoint (KOP-1) (May 2024)



Figure 3.5-1 Key Observation Points

KOP 2 (Photo 3.5-2): This KOP is located along Urunao Road adjacent to the proposed facilities construction site. This site is bordered by Urunao Road along the northwest and northeast side, and steep terrain along the south side. Looking toward the proposed facility construction site from Urunao Road, the unpaved road, the low green shrubs and tall trees are dominating in the fore and middle ground. On the far middle ground, the road divides the view into three parts. On the southeast side of the road, dense, low green shrubs and tall trees are in the fore and middle ground. In the middle, the beige, sandy road wraps around the proposed facilities construction site. On the northwest side of the road, a 6-foot-tall, grey/brown fence adds some contrasting metal texture to the vegetated area. Because of the mesh texture of the fence and the height of the trees, the fence does not block the view of the vegetation and almost blends in with the vegetation in the background.



Photo 3.5-2 Looking Toward the Facilities Construction Site from KOP 2 on Urunao Road (May 2024)

KOP 3 (Photo 3.5-3): This KOP is at the existing jeep trail looking uphill toward the proposed facilities construction site on Urunao Road. Beige and green earthy ground on the unimproved trail dominates the fore and middle ground, surrounded by dense low green shrubs and some tall trees. The sky in the background is partially blocked by the dense foliage in the middle ground.



Photo 3.5-3 Looking Southeast Along Jeep Trail Toward Intersection with Urunao Road from KOP 3 (May 2024)

KOP 4 (Photo 3.5-4): This KOP is located a few feet south of the existing Recreational Access Road near the intersection with Highway 3A. In the foreground is the existing Nature Center and associated parking lot. Visible in the background to the right of the Nature Center are the rest of the existing DOI facilities and parking.



Photo 3.5-4 Looking Toward the Existing Department of Interior Facilities from KOP 4 (May 2024)

3.5.2 Environmental Consequences

The analysis of visual impacts in this section addresses whether the proposed action would alter views or scenic quality; change light, glare or shadows; or substantially affect sensitive receptors to a changed view. The impact analysis applies the following concepts:

- Establish representative KOPs that represent common public viewing areas.
- Assess the existing landscape from the KOPs identified by evaluating the form, line, color, and texture of both natural and human-made elements.
- Assign a contrast rating from each KOP, informed by site visit, desktop research, and design drawings. The contrast rating evaluates how the form, line, color, and texture of the project components would contrast against the existing landscape.
- Evaluate the visual impact from each KOP in terms of intensity (degree of visual contrast) and context (the viewing location, the surrounding landscape, the scarcity or importance of the view, and the change in scenic quality).

Levels of contrast are summarized in Table 3.5-1. This information is used to determine whether the proposed development would substantially and permanently alter the landscape characters or scenic quality associated with particularly unique, important, or publicly recognized vistas, viewsheds, viewpoints, or features of the scenic vistas and view planes.

Table 3.5-1 Visual Contrast Levels

Level of Contrast	*Criteria*
None	The element contrast is not visible or perceived.
Weak	The element contrast can be seen but does not attract attention.
Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape.
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

Source: Bureau of Land Management 1986.

3.5.2.1 No-Action Alternative

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

3.5.2.2 Alternative 1

Construction of DOI Facilities and Associated Infrastructure

During construction and demolition activities, fencing would be installed to obstruct and minimize views of heavy equipment, stockpile areas, and other building construction activities. Impacts from construction-related activities to visual resources would be short term. Therefore, construction would result in less than significant impacts to visual resources.

The replacement DOI facilities under Alternative 1 would be visible from some of the KOPs, resulting in permanent impacts to visual resources; however, as explained below for each KOP, these impacts would be less than significant.

KOP 1: This viewing point is popular with visitors. Looking toward the ROI from higher elevation, the new DOI facilities would be partially visible in the far middle ground, surrounded by lush green forests. The added built features would increase some visual contrast by adding building height and mass, hard smooth human-made surfaces, and grey pavement color to the green natural textured view. However, due to the distance between the viewing point and the ROI and the abundance of tall vegetation, the built features would be relatively small in scale. The visual contrast would attract some attention but does not dominate the characteristic landscape relative to the field-of-view. The new DOI facilities would not diminish the scenic quality of this KOP.

KOP 2: The sensitive receptor at this viewing location would be the staff at the new DOI facility and people traveling along Urunao Road. From this KOP, the new facility would start to be the dominant feature in the foreground to middle ground. A landscaping plan would be implemented to reduce the contrast level between the new facilities and the surrounding environment. Bioswale and infiltration/stormwater ponds would be incorporated into the landscape, which would create more natural green space at the site. Native trees, shrubs, and other screen plantings would be planted around buildings, parking lots, roads, and enclosures to visually soften the form of the manmade

structures. With these landscaping measures, the visual contrast is expected to be moderate. Compared to the No-Action Alternative, the proposed development would diminish the scenic quality at this KOP by replacing the existing vegetation along this section of Urunao Road with buildings, parking lots, and improved roads. The facility would add a new contrast with the surrounding forest, resulting in a moderate contrast. Given this moderate contrast and that the existing view of the forest shrubs and trees from this KOP is not unique, visually important, or a publicly recognized scenic view, the new DOI facilities would not diminish the scenic quality of this KOP.

KOP 3: Looking east toward the new facility location from this lower elevation, the new single-story facilities in Alternative 1 would likely not be visible from this KOP. With vegetation removal required for improvements to the existing jeep trail and construction of the parallel concrete path, the improved Jeep Trail Road and pedestrian path would become the dominant feature in the fore and middle ground. Concrete and asphalt pavements would increase some visual contrast by adding hard human-made surfaces. The visual contrast would attract some attention but would not dominate the characteristic landscape relative to the field of view.

KOP 4: From this vantage point near the existing Recreational Access Road's intersection with Highway 3A, the new facilities would not be visible. From this area facing Northeast toward Ritidian Point, only the existing DOI facilities are visible in the background. Under Alternative 1, these existing facilities would be demolished and present the opportunity for potential habitat restoration, reducing the overall view contrast between vegetation and manmade facilities.

Alternate Access to Publicly Accessible Areas of the Refuge

The sensitive receptors for the proposed roadway improvements would be people traveling along these roads and visitors/staff at the new DOI facilities. During Phase 1 construction, the public would have full or partial access to these roads. Construction equipment, material, and activities may be visible and are expected to cause strong visual contrast within natural forest and to have impact on visitors' visual experiences. The view of forest vegetation along the roadways is not considered as a unique or rare scenic resource, and the impacts from the construction activities would be temporary.

Post-construction, the improved Urunao Road and Jeep Trail Road may be partially visible from KOP 1, but due to the distance between the viewing point and the ROI and the abundance of tall vegetation, the visual contrast is expected to be weak. From KOP 2 and KOP 3, the road improvements would lead to new grey, hard, manmade surfaces, which can be a moderate to strong visual contrast within a tropical jungle setting. However, because natural vegetation would remain on both sides of the roadways, the visual quality would not be diminished. The underground utility work along portions of Highway 3A would not have any visual effects after the installation phase. Minor improvements to the Recreational Access Road such as filling potholes and leveling would not present an element of visual contrast for viewers along the road.

For the reasons described above, Alternative 1 would result in less than significant impacts to visual resources.

Demolition of Existing Facilities and Site Preparation for Potential Habitat Restoration and Regeneration

Proposed demolition activities would be contained within a fenced construction site. Fencing would obstruct and minimize views of heavy equipment, stockpile areas, and other building demolition activities. Impacts from demolition-related activities to visual resources would be short term. Given no

visual contrast and the limited construction period, the demolition activities would result in less than significant impacts to visual resources.

The proposed preparation of the demolition area for potential habitat restoration and regeneration would provide the existing DOI facilities site with a variety of native vegetation to promote diverse mixes and prevent a monocultural ecology. The site would eventually grow to create an area with similar form, color, and texture as its surrounding forest area. The straight lines from the buildings and parking lots would no longer exist. The visual contrast between this site and the surrounding landscape would be weak and would eventually, when the site is fully vegetated, result in a beneficial impact to visual resources.

3.5.2.3 Alternative 2

The only difference between Alternatives 1 and 2 is at the new facilities site; Alternative 2 includes a single two-story structure that would contain the administration, laboratory, and Nature Center on a smaller parcel of developed land. Because of the long distance between the KOP 1 viewing point and the new facilities, and the abundance of tall vegetation in between, the two-story building height would still appear relatively small in scale. With regards to KOP 2, the two-story building would attract attention on the foreground to middle ground, when the building is not visually blocked by tall trees planted around it, forming moderate to strong visual contrast with the surrounding forest environment. However, the height of the two-story building would diminish from KOP 2 as the setback increases from the roadside. As with Alternative 1, the existing view from this KOP is not particularly unique, important, or a publicly recognized scenic view; and the visual contrast would be softened by the landscaping. With regards to KOP 3, like Alternative 1, the improved Jeep Trail Road and pedestrian path would form some weak visual contrast in the fore and middle ground. However, under Alternative 2, the roofline of the new two-story facilities could also become partially visible in the background from KOP 3, also forming a weak visual contrast. There would be no difference in access or demolition impacts. Given the similarity of Alternative 2 to Alternative 1, the impacts from construction-related activities would be the same, resulting in less than significant impacts to visual resources.

3.6 Socioeconomics

Socioeconomics describes attributes and characteristics relating to the interaction of social and economic factors in the human environment. Socioeconomic conditions considered in this EA include population, employment, housing, and community cohesion, with an emphasis on the effects related to a potential increase in demand for foreign construction workers to implement the proposed action. The ROI for socioeconomics includes all of Guam.

3.6.1 Affected Environment

Population. According to the most recent U.S. census, Guam had a population of 153,836 in 2020, representing a decrease of 3.5 percent compared to the 2010 census and a decrease of 0.6 percent since 2000 (U.S. Census Bureau [USCB] 2021a, 2001). Although it represents the most recent and best available source of Guam population data, the 2020 census is known to have been impacted by COVID-19 pandemic restrictions and therefore may have underestimated the 2020 population (Guam Bureau of Statistics and Plans 2022).

Employment. The pandemic severely impacted Guam employment in 2020, to an even greater degree than the U.S., including Hawaii, because international tourism traditionally comprises a higher relative

proportion of the Guam economy. The unemployment rate on Guam rose from 3.6 percent in September 2019 to 19.4 percent in December 2020 at the height of pandemic restrictions. By December 2021 the unemployment rate had dropped to 7.2 percent and by December 2022 had declined further to 4.0 percent (Guam Department of Labor 2023a). According to the 2020 census, the construction industry was the fourth largest employer on Guam, but as of 2023 the construction sector had rebounded more quickly and more substantially than other leading industries directly linked to tourism. Construction employment increased from an estimated 7,860 workers in September 2020 to 10,710 in September 2022.

Construction on Guam is largely dependent on the H-2B visa program under which employers can temporarily bring foreign workers to the U.S. to perform work to supplement the local workforce. H-2B classifications are granted for varying amounts of time and can be extended in increments up to 1 year each, with a maximum stay of 3 years for each H-2B worker (U.S. Citizenship and Immigration Services 2023a). For decades, Guam relied heavily on the H-2B visa program for skilled workers, especially in the construction industry. Beginning in late 2015, following a federal policy change, all new Guam H-2B worker applications were denied because of a more restrictive interpretation of the requirement that the need for H-2B visas must be temporary in nature. By May 2018 there were no H-2B workers on Guam and, as such, many ongoing private sector, local government, and military construction projects were delayed and start dates for new projects were postponed (Office of the Governor 2022). The rate of H-2B visa approvals increased substantially under an exemption in the 2018 NDAA for construction projects "associated with" or "directly connected" to the military buildup, but this had limited applicability to private sector and other nonmilitary projects. The 2021 NDAA extended the criteria for approval of H-2B visas to include projects "supporting" or "adversely affected by" the military buildup, thereby increasing the allocation of H-2B workers to more commercial, local government, and private sector construction projects (U.S. Citizenship and Immigration Services 2023b). Under these new conditions, the number of H-2B workers increased from zero in May 2018 to 2,286 by January 2022 and 4,000 by April 2023. The Guam Department of Labor forecasted in early 2023 that the number of H-2B workers could reach 6,000 as the military buildup continues (Guam Department of Labor 2023b). The "temporary need" authority from the 2018, 2019, 2021, and 2024 NDAAs that allows H-2B construction workers to obtain visas on Guam is currently set to expire on December 31, 2029.

Housing. The 2020 census reported a total of 51,555 housing units on Guam, an increase of only 2 percent (988 units) since 2010 (USCB 2021b). This low rate of growth in housing stock contributed to a steady increase in prices and an associated decline in affordability. During the 2010–2020 decade, both the H-2B visa situation and the military buildup-related construction activity became major contributing factors to the low rate of new housing construction in the private sector, as the allocation of H-2B visas and the number of non-military projects associated with the buildup were limited. The 2021 NDAA's expanded criteria for associating non-military projects with the military buildup resulted in more H-2B workers being allocated to commercial, local government, and private sector construction projects, including new housing. The recent increase in new housing construction is expected to continue.

Community Cohesion. Community cohesion relates to how factors that unify communities and their way of life can change due to external influences. As noted in the 2015 SEIS, in the past there have been local concerns expressed about foreign construction workers competing for local jobs and potentially disrupting local community cohesion due to unfamiliarity with local customs. The H-2B program rules require that sponsoring companies document an insufficient number of local qualified workers as a condition of approval, so H-2B workers are temporarily filling an increased need for skilled labor and not

competing with the local workforce for construction jobs. Moreover, almost all the recent H-2B construction workers going back to 2018 are from the Philippines, whereas in previous decades a sizeable portion of H-2B construction workers came from a wider array of countries. Research has demonstrated strong pre-historical, historical, demographic, linguistic, and other cultural connections between the people of the Philippines and Guam (Pobutsky and Neri 2014).

3.6.2 Environmental Consequences

The potential effects of the proposed action on socioeconomics were evaluated in this EA by comparing the anticipated project-driven changes in the resident and temporary worker populations on Guam to current conditions. A direct project-related change in these populations could indirectly affect the socioeconomics of Guam via supply and demand conditions in the labor and housing markets and local perceptions and concerns about community cohesion.

3.6.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed replacement of DOI facilities, access improvements, and site demolition/preparation would not occur, there would be no increase in demand for construction labor or materials, and there would be no change in existing socioeconomic conditions.

3.6.2.2 Alternative 1

Population. The proposed action would include a small increase in DOI staffing at the Refuge, but not beyond historic staffing levels. Construction workers would continue to be sourced from both the local Guam workforce and temporary H-2B foreign workers. The H-2B workers are not included in official population counts and are allowed on-island for a maximum of three years. Therefore, the proposed action would have no effect on the size or composition of Guam's resident population.

Employment. The proposed action would temporarily contribute to the local economy and employment on Guam by providing a demand for construction workers and direct expenditures for materials, equipment, and employee wages during project construction. These direct expenditures would in turn have positive indirect effects as some of those funds are spent on local goods and services by companies and workers. However, given that the proposed construction would occur in discrete phases (e.g., new facility construction and road improvements first, followed several months later by existing facility demolition and preparation of the site for potential habitat restoration and regeneration), and considering the size and scale of the proposed project, the proposed action would have a less than significant impact to employment and the overall economy on Guam.

Housing. The proposed action would not increase the resident population of Guam and would therefore not increase demand for limited private sector housing. While the proposed action would contribute to the overall demand for H-2B non-resident construction workers, the H-2B program requires construction companies sponsoring more than five workers to provide for their housing. As a result, almost all H-2B workers are housed in barracks facilities provided on private land by the sponsoring construction companies and reserved for H-2B workers only. By the time the Proposed Action is implemented, it is likely that sufficient capacity in pre-existing barracks would already exist to accommodate some or all of the H-2B workers required. While there were initial delays in constructing enough workforce housing units to accommodate the rapid increase in H-2B workers, since 2021 the Guam government has streamlined the approval process for such projects and several large barracks projects are planned or under construction to house the projected number of H-2B workers. As a result, H-2B workers would not

be competing directly with Guam residents for local housing and impacts to the housing market would be less than significant.

Community Cohesion. While the number of H-2B workers potentially needed for the proposed construction is unknown, nearly all H-2B construction workers hired in recent years are from the Philippines. Therefore, it is reasonable to assume that a substantial proportion of any additional H-2B workers for the proposed action would also be Filipino. Given the well-established and long-standing cultural ties between the Filipino and Guam populations, any potential impacts to community cohesion would be less than significant.

For the reasons described above, Alternative 1 would have temporary and less than significant impacts to socioeconomic conditions on Guam.

3.6.2.3 Alternative 2

Under Alternative 2, some of the DOI facilities would be constructed in a two-story configuration, which would reduce the overall project footprint compared to Alternative 1. However, in conjunction with the other components of the proposed action including road improvements and demolition of existing facilities, the overall scale, duration, and labor requirements of the proposed construction activities would not differ from Alternative 1. Therefore, Alternative 2 would have similar temporary and less than significant impacts to socioeconomics as Alternative 1.

3.7 Environmental Justice

Executive Order (EO) 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, issued in 1994) and EO 14096 (*Revitalizing Our Nation's Commitment to Environmental Justice for All*, issued in 2023) require federal agencies to assess the potential for their actions to have disproportionate and adverse environmental and health impacts to minority and low-income populations. EO 13045 (*Protection of Children from Environmental Health Risks and Safety Risks*, issued in 1997), requires a similar analysis for children, where federal agencies must identify and assess environmental health risks and safety risks that may disproportionately affect children. Per the most recent CEQ implementing regulations for NEPA (CEQ 2024), environmental justice means "the just treatment and meaningful involvement of all people regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision making and other Federal activities that affect human health and the environment so that people:

> (1) Are fully protected from disproportionate and adverse human health and environmental effects (including risks) and hazards, including those related to climate change, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and
>
> (2) Have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices."

These updated NEPA implementing regulations also define *communities with environmental justice concerns* as those communities that may not experience environmental justice as defined above.

In the context of the proposed action in this EA, the analysis described in this section follows current DoD guidance on how to identify communities with environmental justice concerns. Using 2020 census

data for Guam, the analysis identified components of the population defined as minority, low-income, and/or children. The following definitions apply to such data described in this section:

- "Minority" refers to people who are Pacific Islander, as well as those who are non-Pacific Islander of a race other than white alone (CEQ 1997; USEPA 1998, 1999).
- "Low income" is based on the official national poverty line according to the U.S. Census.
- "Children" are defined as people under the age of 18 according to the U.S. Census.

The ROI for environmental justice includes all of Guam.

3.7.1 Affected Environment

Demographic data relating to environmental justice are presented for Guam and the entire U.S., which is used as a reference area to gauge the relative proportionality of population subsets to help identify communities with environmental justice concerns. Table 3.7-1 provides demographic information on race, age, and poverty status for Guam and the U.S.

Table 3.7-1 Demographic Indicators in the ROI

Demographic	*Guam*	*United States*
Race		
Native Hawaiian and Other Pacific Islander	46.0%	0.3%
Asian	35.5%	6.3%
White	6.8%	75.8%
Black or African American	0.9%	13.6%
American Indian and Alaska Native	0.1%	1.3%
Some Other Race	0.6%	NA
Two or More Races	10.0%	NA
Under 18 Years Old	27.0%	21.7%
Percent of Individuals in Households with Incomes below the poverty level	20.2%	11.6%

Source: USCB 2022a, 2022b, 2021c.

An area is considered a "minority area" if 50 percent or more of its population is a combination of American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, Black, or Hispanic, or if the percentage of the minority population is meaningfully greater than the minority population percentage in the general population or reference area (CEQ 1997). As shown in Table 3.7-1, the combined Native Hawaiian and other Pacific Islander, Asian, and other minority populations comprise more than 50 percent of Guam's total population and these populations also comprise a much larger proportion than they do in the reference area. Therefore, Guam qualifies as a minority area for Environmental Justice considerations.

Low-income populations were identified using methods recommended by the Environmental Justice Interagency Working Group and NEPA Committee (USEPA 2016) and guidelines issued by the CEQ (1997). An area is considered a "low-income area" if the percentage of households with incomes below the poverty line is greater than the reference area (USEPA 2016; CEQ 1997). For this analysis, the reference area is the entire U.S. population. Since Guam has a higher percentage of its population living below the poverty level (20.2 percent) than the reference area (11.6 percent), it is considered a low-income area.

Guam also has a higher percentage of children in the population (27 percent) compared to the reference area (22.2 percent), but environmental justice effects on children are evaluated based on their presence in the area where other resource impacts would occur (i.e., in the Refuge).

3.7.2 Environmental Consequences

The environmental justice analysis utilizes the evaluation of impacts presented in the other resource sections in this chapter to determine if any of those impacts would result in disproportionate adverse effects on racial minorities, children, and/or low-income populations. The analysis for each applicable resource is based on the following criteria to determine potential impacts to environmental justice:

Criterion 1: There must be a minority, low-income, or child population that would be impacted by the action. As described above in Section 3.7.1, Guam qualifies as both a minority and a low-income population, and the proportion of children is higher than in the reference population.

Criterion 2: If Criterion 1 is satisfied for any given resource impact, the applicable communities with environmental justice concerns must be disproportionately affected, or the impact would not represent an environmental justice impact. Disproportionality implies that minority, low-income, and/or child populations would be affected more strongly than non-minority, higher-income, or adult populations.

Criterion 3: If Criterion 1 and 2 are both met then an environmental justice impact would occur, and the significance of such an impact would depend on whether the applicable resource impact was determined to be potentially significant.

3.7.2.1 No-Action Alternative

When the MPMG Range SDZ is activated, there would be no public or staff access to either the current DOI facilities or the publicly accessible areas within the SDZ. There would also be no alternative access to other publicly accessible portions of the Refuge outside the SDZ. While access to the existing DOI facilities would be available when the SDZ is not activated, the DOI's ability to manage the Refuge and achieve the purposes for which the Refuge was established would be severely constrained under such conditions. School field trips would not occur during times the SDZ is activated, but they would likely be rescheduled to occur when the SDZ is not activated; therefore, children would not be affected disproportionately by reduced access to recreation. Per Criterion 2 above, these impacts would affect all populations equally and no minority, low-income, or child populations would be affected disproportionately. Therefore, the No-Action Alternative would not result in Environmental Justice impacts.

3.7.2.2 Alternative 1

For socioeconomics, as described in Section 3.6.2, the proposed action would result in only a small, temporary, and less than significant effect on the local Guam economy. Criterion 2 would not be met because none of the socioeconomic impacts would be disproportionate, so the socioeconomic impact would not have an environmental justice impact.

For air quality and GHG emissions, as described in Section 3.1, while GHG emissions would occur during construction, the impacts would be considered temporary and negligible. Criterion 2 would not be met because the impact would not be disproportionate, so air quality, GHG emissions, and climate change effects would not represent an environmental justice impact.

For the remaining applicable resources that could have a potential environmental justice impact (recreation, cultural resources, visual resources, and noise), the impacts would be to people visiting the Refuge during normal operating hours. For recreation, visitors may be temporarily impacted during certain construction activities but would experience efficient access to recreation areas post-construction. Similarly, for cultural resources, CHamoru people wanting to visit specific cultural sites within the Refuge to maintain a connection to their history and culture may also be impacted by construction activities. Although not anticipated, closures of the Refuge or portions of the Refuge due to construction activities may occur, but disrupted access to these areas would be temporary and intermittent**.** In addition, construction activities would not change the cultural sites, reduce the number of cultural sites, or affect the ability of CHamoru people to access them post-construction. Short-term visual impacts would occur during construction of the new DOI facilities and post-construction the new facilities would have a permanent but less than significant visual impact from some vantage points. The proposed road improvements and demolition of the existing DOI facilities would have minor visual impacts and the proposed preparation of the demolition area for potential habitat restoration and regeneration would result in longer-term positive visual effects. Noise impacts near construction activities would be temporary and less than significant. Because none of these other resource impacts would disproportionately affect minority or low-income populations, they would not represent an environmental justice impact.

If any school field trips were to occur during construction or be deferred until after construction of the DOI facilities, then children could potentially be affected disproportionately by reduced access to recreation. However, the identified impacts would not involve risks to the health or safety of children, would be temporary in nature, and all resource impacts would be less than significant. Therefore, the potential environmental justice impact to children would be less than significant.

3.7.2.3 Alternative 2

The only difference between Alternatives 1 and 2 is that some of the DOI facilities in Alternative 2 would be constructed in a two-story configuration and have a smaller total footprint. All the types and duration of proposed construction activities would be the same. Therefore, environmental justice impacts associated with Alternative 2 would be the same as described for Alternative 1.

3.8 Noise

Noise is unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. Noise may be intermittent or continuous, steady or impulsive, and stationary or transient. Common noise-sensitive receptors include the public in schools, residential areas, and recreational areas. This section applies to human receptors; impacts to wildlife are addressed in Section 3.2, *Terrestrial Biological Resources*. The ROI for noise is the area within a half mile of proposed facility construction, demolition, site preparation, and road improvement or utility realignment activities.

Human hearing ranges up to 120 dB, at which point sound causes physical discomfort. A-weighted decibels (dBA) are an expression of the relative loudness of sound in air as perceived by the human ear. For example, at approximately 3 feet, sound from normal human speech ranges from 63 to 65 dBA, operating kitchen appliances range from 83 to 88 dBA, and rock bands approach 110 dBA.

The day-night average sound level (DNL) metric is the energy-averaged sound level measured over a 24-hour period, with a 10 dB penalty assigned to noise events occurring between 10:00 p.m. (2200) and 7:00 a.m. (0700) (often referred to as “acoustic night”). The penalty is assigned because humans

perceive noise to be more intrusive at night. Most people are exposed to sound levels of 50 to 55 DNL or higher on a daily basis (Federal Interagency Committee on Urban Noise 1980). The 65 dB DNL noise contour is commonly used to evaluate the compatibility of aircraft operations, road and rail traffic, and marine navigation with local land use.

3.8.1 Affected Environment

The ROI is in an undeveloped area used for recreational activities such as wildlife observation, cave and forest tours, hiking trails, cultural resource interpretation, and environmental education. These recreational areas are 1,000 feet from the proposed facility construction site, which represents the majority of proposed construction activity. There is some minimal vehicle traffic noise along Highway 3A and Urunao Road, as well as noise from aircraft at AAFB and ground training at Northwest Field.

3.8.2 Environmental Consequences

3.8.2.1 No-Action Alternative

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

3.8.2.2 Alternative 1

Construction activity would result in short-term, intermittent noise impacts from the operation of construction equipment, power and hand tools, and trucks delivering material and construction worker vehicles throughout the ROI. Construction would occur primarily during daytime hours; nighttime construction would be minimized to the greatest extent possible.

The analysis utilized the Federal Highway Administration's Road Construction Noise Model to calculate typical maximum sound levels at several distances for common types of equipment that could be used under Alternative 1. Facility construction included several common pieces of construction equipment such as a clam shovel, concrete saw, compactor, dozer, crane, excavator, generator, dump truck, pneumatic tools, etc. The analysis of the demolition of the DOI facility included the concrete saw, mounted impact hammer, jackhammer, dozer, dump truck, and clam shovel. The noise levels for the road construction/improvements/repairs activity included scraper, dozer, compactor, roller, and dump trucks. Table 3.8-1 details the resulting typical maximum sound levels.

Table 3.8-1 Typical Noise Levels (dB Maximum Sound Level) at Various Distances from Construction and Demolition Equipment Operation

Distance from Noise Source (ft)	*Phase 1: Facility Construction*[1]	*Phase 1: Road Construction/ Road Improvements/ Road Repairs*[1]	*Phase 3: Demolition of DOI Facility*[1]
50	90	84	90
100	84	78	84
250	76	72	76
500	70	64	70
750	66	60	66
1000	64	58	64

Notes: [1]Noise levels based upon typical construction equipment that may be utilized for each activity.

Source: Federal Highway Administration 2006.

Portions of time during Phase 1 construction would result in elevated noise levels within the vicinity of the proposed facility site with maximum sound levels attenuating to ambient levels within 1,000 feet. During a portion of Phase 1 road construction, improvements and pothole repairs would occur along Highway 3A, Urunao Road, Jeep Trail Road, and Recreational Access Road. The resulting noise levels for road-related work would attenuate to ambient levels within approximately 500 feet of the road work. During Phase 3 demolition of the DOI facility, noise levels would attenuate to ambient levels within approximately 1,000 feet from the demolition equipment.

The only areas considered noise-sensitive within the ROI and at any risk of noise impact are recreational areas such as beaches, hiking trails, residents along Urunao Road, and the Ritidian Beach scenic point along Highway 3A. However, all these areas are approximately 1,000 feet or farther from the proposed facilities construction site; the nearest residents along Urunao Road are 1,500 feet from the southernmost extent of proposed construction. The loudest construction equipment emits noise levels up to a maximum sound level of 90 dB at 50 feet that would attenuate to less than 64 dB at the nearest recreational area or residence and, as such, while it may still be audible, it would not be distinguishable from the existing environment. Furthermore, nighttime construction would be minimized to the greatest extent possible. Therefore, Alternative 1 construction noise impacts would be less than significant. Section 3.2, *Terrestrial Biological Resources*, discusses the potential of noise impacts to biological resources.

3.8.2.3 Alternative 2

Under Alternative 2, the type and duration of proposed construction activities would be the same as Alternative 1, and the location and proximity to the nearest human receptors would also be the same. Therefore, Alternative 2 construction noise impacts would be less than significant.

3.9 Water Resources

Water resources include surface water, groundwater, wetlands, and floodplains (Table 3.9-1). The ROI for water resources is the project area on the northern tip of Guam, shown in Figure 1-1, which includes the western portion of the Refuge outside of the SDZ, and the existing DOI facilities that would be demolished.

Table 3.9-1 Definition of Water Resources

Water Resource	*Definition/Description*
Surface Water	*Surface water resources* comprise lakes, rivers, and streams and are important for a variety of reasons including ecological, economic, recreational, aesthetic, and human health.
Groundwater	*Groundwater* comprises the subsurface hydrologic resources of the physical environment. Groundwater characteristics are often described in terms of depth to aquifer, aquifer or well capacity, water quality, and surrounding geologic composition.
Wetlands	*Wetlands* are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.
Floodplains	*Floodplains* are areas of low, level ground present along rivers, stream channels, or coastal waters that are subject to periodic or infrequent inundation because of rain or melting snow.

3.9.1 Affected Environment

Northern Guam is an undulating limestone plateau devoid of surface water features because of high infiltration rates due to the porous and permeable limestone formations (Villareal et al. 2022; DON 2015). There are no surface water resources within the ROI. Runoff primarily occurs during intense storm events via overland sheet flow, channelized flow, and through a series of depressions and sinkholes.

The primary aquifer on Guam is the Northern Guam Lens Aquifer (NGLA) that extends from the northernmost tip of the island to where the southern highlands start north of Apra Harbor. The NGLA is a federally registered sole source aquifer, and its freshwater lens supplies up to 90 percent of the 45 million gallons per day of water produced for Guam (Habana et al. 2022). The NGLA is composed of six distinct groundwater subbasins. The ROI overlies a portion of the Finegayan subbasin (JRM 2022), which receives the most annual rainfall of all six basins (Villareal et al. 2022). High water infiltration through the permeable limestone into the groundwater basin has caused several depressions and sinkholes within the ROI (Habana et al. 2022). Due to high groundwater basin recharge rates, the groundwater level is close to the ground surface, measuring approximately 1 foot below ground surface within the ROI (Figure 3.9-1).

Estuarine and marine wetlands exist just offshore of the western portion of the Refuge (Figure 3.9-1). However, no wetlands are present within the ROI or will be affected by the proposed action and thus are not discussed further in this analysis. The 100-year floodplain extends from the beach area at Ritidian Point out into the near shore waters (Figure 3.9-1) (Federal Emergency Management Agency 2007). The proposed project footprints are all located outside the 100-year floodplain, and thus not discussed further in this analysis.

3.9.2 Environmental Consequences

This analysis focuses on the potential impacts of the proposed action on surface water and groundwater. Groundwater analysis focuses on the potential for impacts to the quality, quantity, and accessibility of groundwater; and surface water quality considers the potential for impacts to improve or degrade current water quality.

3.9.2.1 No-Action Alternative

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

3.9.2.2 Alternative 1

Surface Water

No surface water features are located within or near the ROI. New facility construction under Alternative 1 would disturb more than 1 acre and, as such, requires compliance with the USEPA NPDES Construction General Permit. Adherence to the permit and implementation of a site-specific SWPPP and associated erosion control, runoff reduction, and sediment removal avoidance and minimization measures (e.g., erosion socks, check dams, runoff detention basins, silt fencing, fiber rolls, vegetated and lined waterways, drainage diversions, etc.) would control off-site transport of stormwater runoff, sediment, or other pollutants.

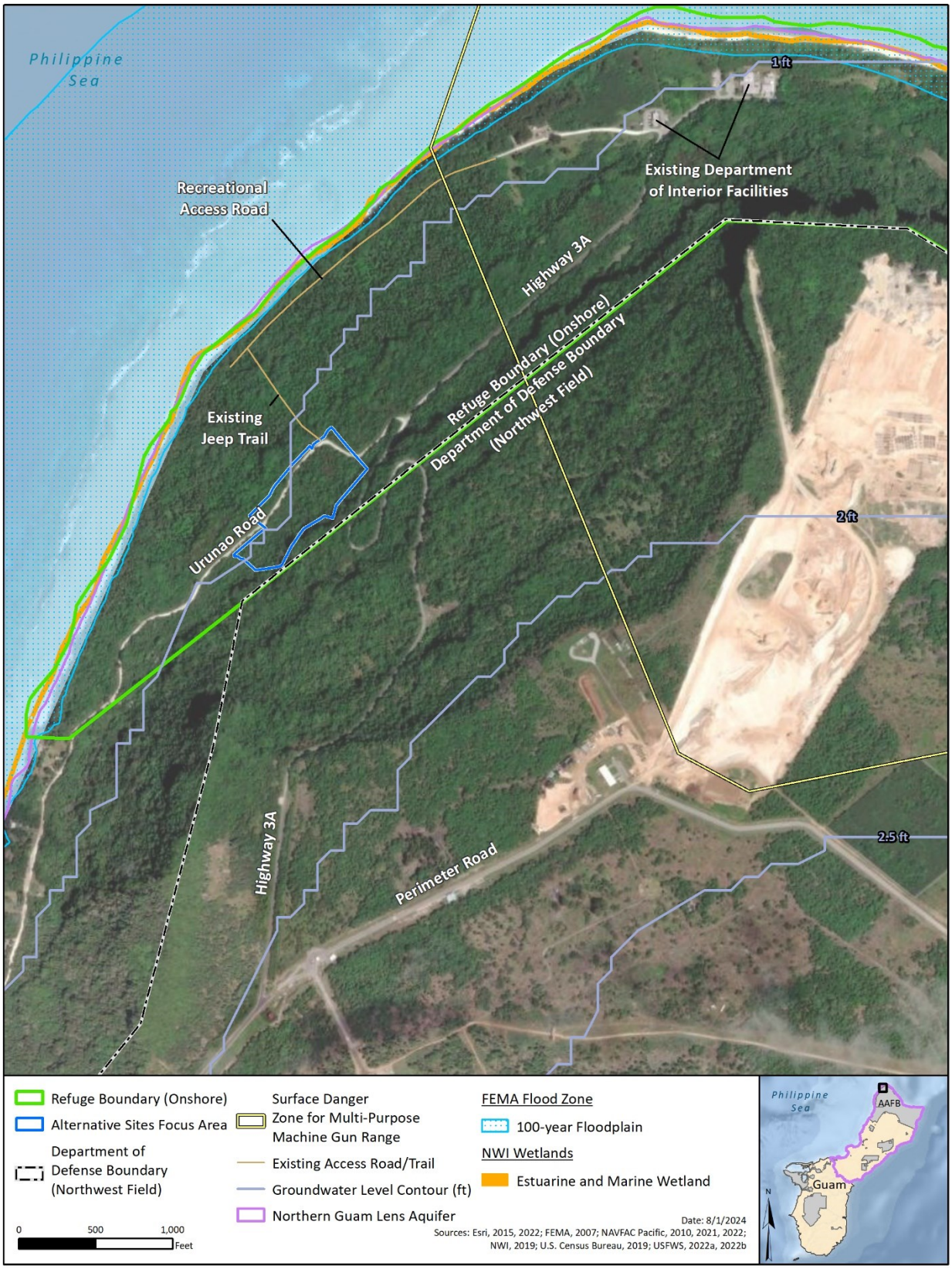


Figure 3.9-1 Water Resources in the ROI

Stormwater runoff would be expected to increase following construction with the addition of new impervious surfaces; however, LID techniques (e.g., revegetation using native plants; use of permeable surfaces; installation of vegetated swales, level spreaders, sediment basins/traps, erosion control blankets, and stormwater retention/detention ponds; and implementation of infiltration and filtering practices, etc.) would be incorporated as part of the new facility design to minimize erosion, runoff, and sedimentation. In accordance with UFC 3-210-10, LID (as amended, 2015), and Section 438 of the Energy Independence and Security Act, any increase in stormwater runoff resulting from new impervious surfaces must be attenuated through the use of such permanent drainage management features (under these requirements, any federal facility project of more than 5,000 square feet must maintain or restore the predevelopment hydrology of the property).

The road improvements would add a small amount of new impervious surface. No surface water features are located within or near the proposed access road or improvement areas. Roadway-specific avoidance and minimization measures (e.g., open vegetated channels, bioretention areas, infiltration and filtering practices, etc.), as identified in the 2006 CNMI and Guam Stormwater Management Manual, would be included in the planning, design, and construction of all roadways and facilities. The Marine Corps would also prepare an Erosion Control Plan and comply with all required clearing, grading, and stockpiling permits issued by the Guam Environmental Protection Agency for the road improvements. The demolition area site would be prepared by clearing the existing buildings and demolition debris, grading the ground surface, and placement of topsoil. Potential habitat restoration and regeneration would be managed by the Refuge. Under the management of USFWS, this area over time would be expected to grow into lush native habitat similar to the surrounding area and provide for the return of the site to pre-development hydrology.

Considering no surface water features are located within or near the ROI, the permit requirements, their corresponding controls, the application of avoidance and minimization measures, and the relatively small impact area and resulting impervious surfaces, Alternative 1 would result in less than significant impacts to surface waters within the ROI.

Groundwater

Stormwater runoff protection measures that protect surface waters for the DOI facilities, roadway improvements, and demolition/site preparation area would also protect groundwater quality. By adhering to the provisions of the USEPA NPDES Construction General Permit and implementing avoidance and minimization measures associated with addressing site- and activity-specific water resource protection requirements, pre-construction hydrology would be maintained and protect against stormwater pollution loading potential to the underlying groundwater basins of the NGLA. Consistent with 22 Guam Administrative Rules (GAR) Chapter 10 Section 10107f, an environmental and hydrogeologic assessment would be performed for sinkholes within the project development footprint. Guam's wellhead protection requirements, provided in 22 GAR Chapter 7, requires that the proposed project not be within a wellhead protection area. The wellhead protection area is defined as a minimum of 1,000 feet radius of a water well or wellfield supplying a public water system. The proposed action area is over 6,000 feet away from the closest well and not required to adhere to the wellhead protection rules for this proposed project. Construction of associated infrastructure, such as utility lines and the septic tank, would require trenching and digging to depths below the groundwater elevation. Groundwater is likely to be encountered during construction and would require dewatering that would be managed in accordance with the USEPA NPDES Construction General Permit and site-specific SWPPP. Implementation of Alternative 1 would result in an increase in impermeable surfaces within the

proposed facilities construction site; however, as with surface water, the pre-construction hydrology would be maintained. With regards to the demolition area, during removal of existing building foundations and utilities, groundwater is likely to be encountered and would be managed by the aforementioned permits and plans. Once removed, the site would be prepared for potential habitat restoration and regeneration which would allow for groundwater infiltration without impervious surfaces.

Given compliance with USEPA NPDES Construction General Permit requirements, implementation of avoidance and minimization measures and LID technologies, adherence to the site-specific SWPPP, and the relatively small amount of impacted area, Alternative 1 would result in less than significant impacts to groundwater.

3.9.2.3 Alternative 2

Impacts to water resources for Alternative 2 would be similar to those described for Alternative 1. The only difference between Alternatives 1 and 2 is the size of the development area for replacement facilities (approximately 4.5 acres versus approximately 7.5 acres for Alternative 1), resulting in less impervious surface area and corresponding runoff. Therefore, implementation of Alternative 2 would result in less than significant impacts to water resources.

3.10 Geology and Soils

Geology describes the surface and subsurface materials of which a land area is composed, including soils and rocks (Table 3.10-1). The characteristics of soils and underlying rocks include stability, slope, compatibility, shear strength, and productivity. The ROI for geology and soils is the project area on the northern tip of Guam, shown in Figure 1-1, which includes the western portion of the Refuge outside of the SDZ and the existing DOI facilities that would be demolished.

Table 3.10-1 Definition of Geological Resources

Geological Resource	*Definition*
Topography	*Topography* is the change in elevation over the surface of a land area. An area's topography is influenced by many factors, including human activity, underlying geologic material, seismic activity, climatic conditions, and erosion.
Geology	*Geology* is defined by the distinctive, dominant, mapped and recognizable physical characteristics and features of a volume of rock, and seismicity. Liquefaction is the loss of strength and stiffness of a soil by earthquake shaking or other rapid loading.
Soils	The term *soil* refers to unconsolidated materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability of the ground to support man-made structures.

3.10.1 Affected Environment

The proposed DOI facility construction, road improvements, and demolition projects would be located on near-level land close to Ritidian Point at the northern edge of Guam's limestone structural province. The facility construction site is 60 feet above mean sea level (MSL) and below the limestone plateau, which is 500 feet above MSL. The existing DOI facility is 15 feet above MSL. Bedrock underlying the proposed construction sites is young (Mariana) limestone and karst geology, which is the geologic

setting for sinkholes and caves. Based on available topographic and field data, multiple features have been preliminarily identified as possibly containing sinkholes and caves within the ROI (Figure 3.10-1).

Steep terrain with a high potential for landslides is located along the northwestern and southeastern edges of the new facility focus area (Figure 3.10-1).

The area of alluvium and beach deposits along the coast is the only area in the ROI subject to liquefaction as the rest of the ROI is underlain by consolidated limestone bedrock. The limestone bedrock at the proposed facilities construction sites presents a potential hazard of surface instability and collapse due to sinkholes.

Within the proposed project footprints, there are three soil types (Figure 3.10-2) (Natural Resources Conservation Service 2022):

- Ritidian-Rock Outcrop Complex – underlying the proposed area for the new facility and associated infrastructure.
- Shioya loamy sand – underlying the facility demolition area, Recreational Access Road, and the jeep trail.
- Guam Cobbly Clay Loam – underlying the access road from Highway 3A.

For all three types, runoff is slow, permeability is high, and the hazard of water erosion is slight (U.S. Department of Agriculture 1988).

3.10.2 Environmental Consequences

Protection of unique geological features, minimization of soil erosion, and the siting and design of facilities in relation to potential geologic hazards are considered when evaluating impacts of an action on geological resources. Generally, such impacts can be avoided or minimized with incorporation of appropriate structural engineering designs, construction techniques, and erosion control measures into project development.

Analysis of potential impacts to geological resources typically includes the identification and description of resources that could potentially be affected, examination of the action, and the potential effects it may have on the resource, assessment of the potential impacts, and best management practices or mitigation measures to manage potential impacts.

3.10.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not occur and there would be no impact to geology and soils.

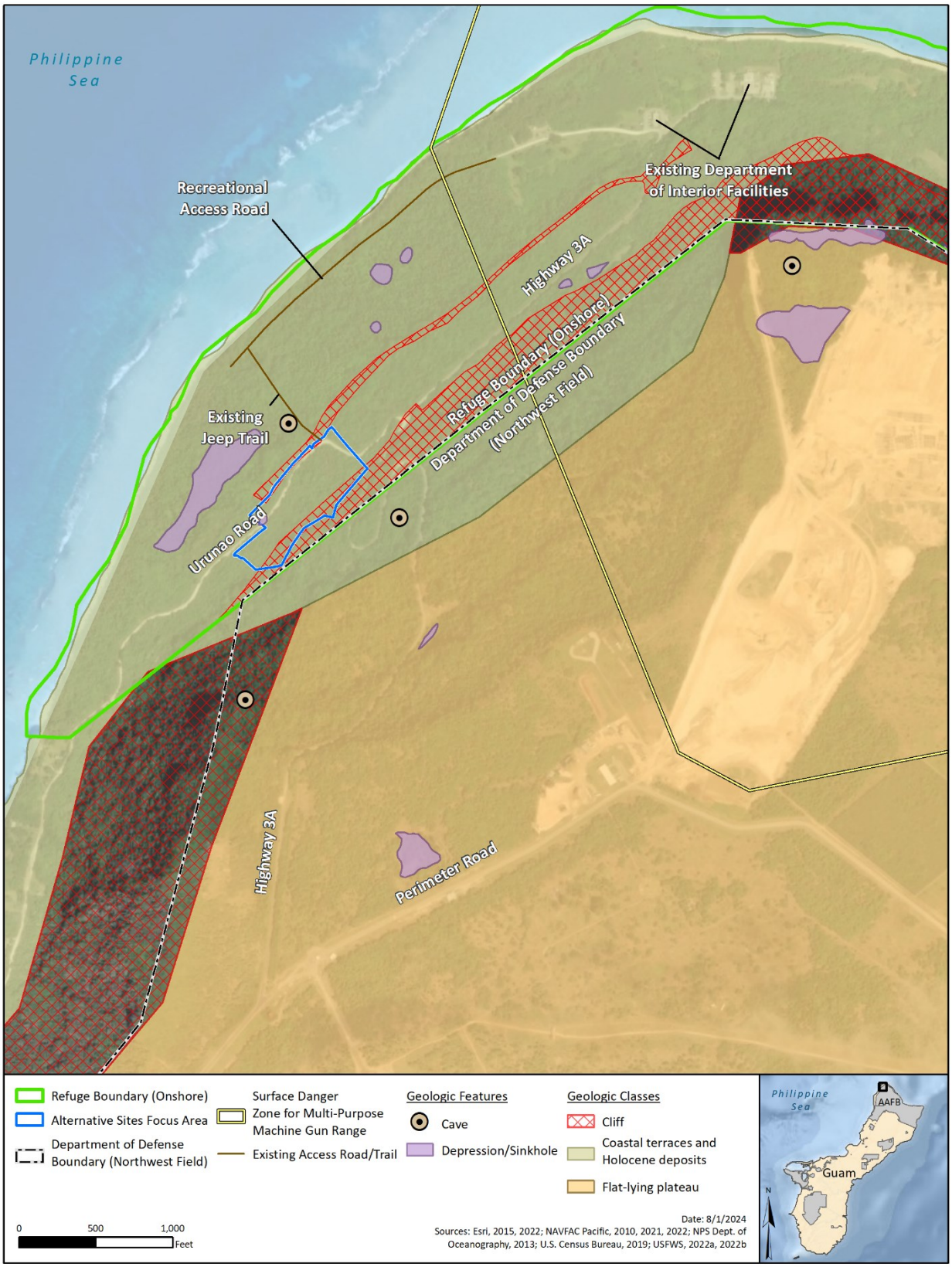


Figure 3.10-1 Geological Features in the ROI

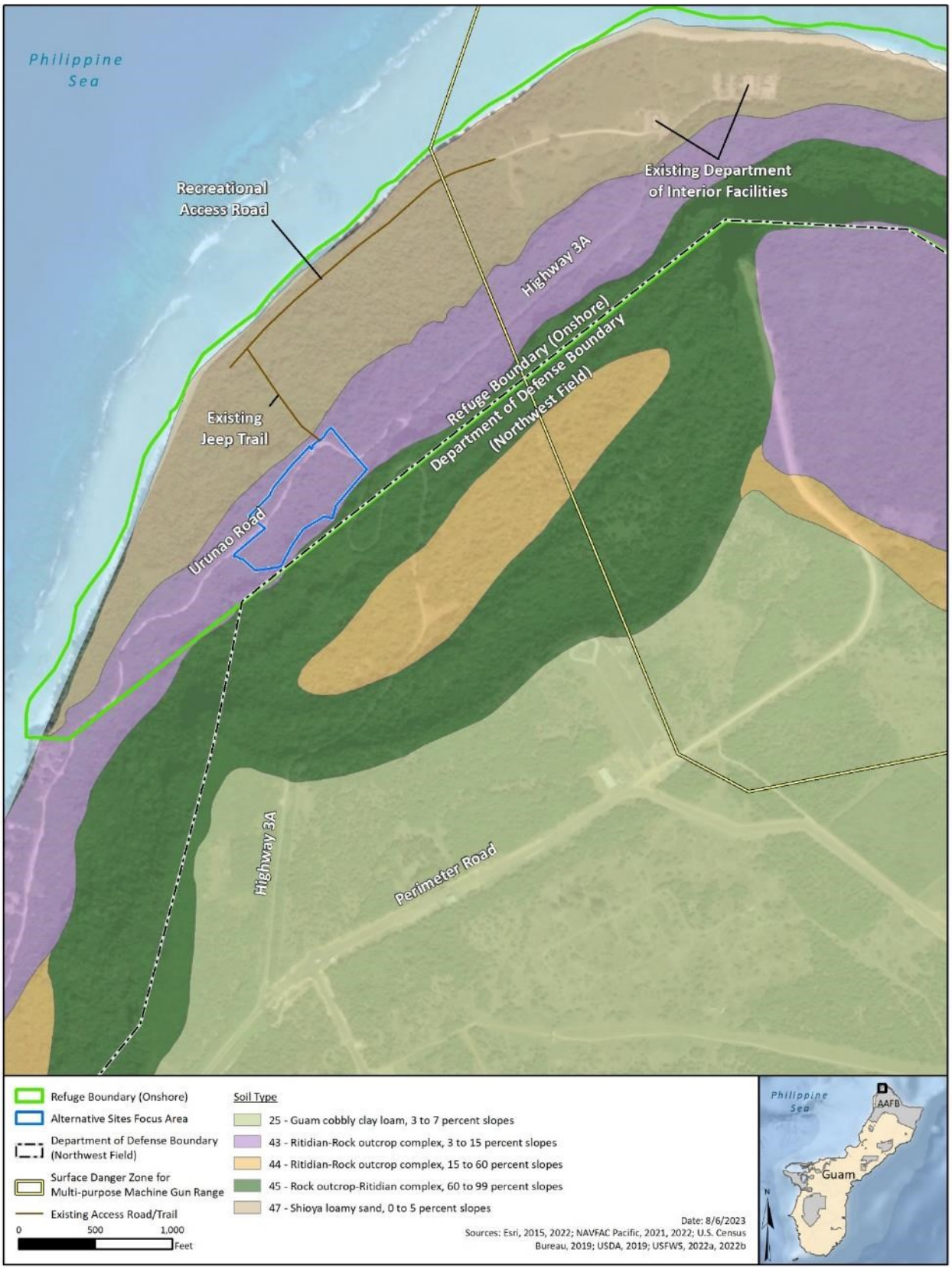


Figure 3.10-2 Soils in the ROI

3.10.2.2 Alternative 1

Alternative 1 would not result in a noticeable change in grade or slope or topography for any construction, improvement, or demolition activity. Therefore, there would be less than significant impacts to topography for Alternative 1.

For any sinkholes and depressions, the Marine Corps would comply with 22 GAR Chapter 10 Section 10107f, which prohibits activities that threaten the viability, function, or the conveyance of surface water into sinkholes. Guam Environmental Protection Agency must authorize any modification to or use of sinkholes and must include an assessment to ensure that adverse effects to the sinkholes do not occur. Avoidance measures would be implemented for the caves to protect their integrity when roadwork occurs. The new DOI facility would be located on relatively level areas consisting of consolidated limestone bedrock that would not be subject to slope instability or liquefaction.

The new DOI facility would be constructed next to steep terrain but would be in a near-level area with surrounding stabilization measures to minimize any potential impacts from landslides. Proposed road improvements and construction would include slope stabilization features to minimize any potential impacts from steep terrain near roadways. The demolition/regeneration area is in a near-level area, with minimal potential for landslides. Construction, road improvements, and demolition/site preparation activities would be implemented on soils that have slow runoff, high permeability, and low erosion potential. While there is a potential for increased erosion, compaction, and soil loss from physical disturbance caused by these activities, these actions would be subject to 22 GAR, Chapter 10, Guam Soil Erosion and Sediment Control Regulations, and the USEPA NPDES Construction General Permit and site-specific SWPPPs specifically designed to minimize erosion and soil loss. Project design and construction engineering control avoidance and minimization measures such as erosion socks, erosion control blankets, silt fencing, and fiber rolls would further reduce erosion, minimize sedimentation, reduce the flow of stormwater, and minimize the transport of soils and sediment off-site. Roadway-specific avoidance and minimization measures such as open vegetated channels, bioretention areas, and infiltration and filtering practices as identified in the most recent CNMI and Guam Stormwater Management Manual would be included in the planning, design, and construction of all roadway improvements. For the demolition area, the aforementioned demolition soil erosion best management practices would be implemented. The demolition area would be prepared by clearing the existing buildings and demolition debris, grading the ground surface, and placement of topsoil. Potential habitat restoration and regeneration would be managed by the Refuge. Under the management of USFWS, this area over time would be expected to grow into lush native habitat similar to the surrounding area, which would help stabilize the soil. Since this area is previously disturbed, and would potentially be regenerated to a native habitat, impacts to soils would not be significant.

For the reasons described above, impacts to geology and soils under Alternative 1 would be less than significant.

3.10.2.3 Alternative 2

Impacts to geology and soil resources for Alternative 2 would be similar to those described for Alternative 1. The only difference between Alternatives 1 and 2 is the size of the development area for replacement facilities (approximately 4.5 acres versus approximately 7.5 acres for Alternative 1), resulting in slightly less ground disturbance than under Alternative 1. Therefore, impacts to geology and soils under Alternative 2 would be less than significant.

3.11 Utilities

The term "utilities" refers to infrastructure supplying the general population and DoD with electrical power, potable water, wastewater, solid waste, and Information Technology/Communications (IT/COMM). The ROI for utilities begins at the intersection of Perimeter Road and Highway 3A and includes the Refuge (see Figure 1-1).

3.11.1 Affected Environment

The following subsections describe the existing conditions for each of the relevant utilities within the ROI.

3.11.1.1 Electrical Power

The Guam Power Authority (GPA) provides all the electrical power used on-island by both civilians and the DoD. The electrical power systems include generation, substations, overhead transmission lines, and distribution lines. The GPA owns and operates most of the island-wide transmission lines and substations. The DoD owns some off-base transmission lines and leases these to the GPA, which operates and maintains them. The Refuge has electrical utility service, but the proposed facility construction site does not. Several emergency standby generators are maintained and operated by GPA under permitted conditions, including a generator at the existing DOI facility location. Existing electrical utilities in the ROI are shown in Figure 3.11-1.

3.11.1.2 Potable Water

Guam Waterworks Authority (GWA) serves the general civilian population on Guam, and the DoD has two systems that serve most of the military installations on Guam. Most water production for the central and northern parts of Guam, including the Refuge, comes from water wells fed by the NGLA.

The potable water system near the proposed facility construction site includes elements of the DoD water transmission and distribution system. This existing system consists of underground water lines and manholes and is supplied by Well AF-5.

The existing DOI facility has a water line but it is unreliable, so the facility uses a water catchment system. Existing potable water systems in the ROI are shown in Figure 3.11-1.

3.11.1.3 Wastewater

There is no wastewater collection system in the immediate vicinity of the replacement facilities. The nearest wastewater utility consists of a buried wastewater collection system serving part of AAFB. This system has an 8-inch diameter sewer along Perimeter Road; however, it is 100 feet higher than the replacement facilities' construction site and is therefore not available to support this site. The existing DOI facility uses septic tanks with a leach field and the replacement facility would install a new septic and leach field system. Existing wastewater systems in the ROI are shown in Figure 3.11-1.

3.11.1.4 Solid Waste

The main municipal solid waste landfill on Guam is the Layon Landfill owned by the Government of Guam. Transfer stations are located around Guam and facilitate municipal solid waste transportation to the Layon Landfill. There are currently no solid waste facilities near the project area for the proposed action.



Figure 3.11-1 Existing Utilities in the ROI

3.11.1.5 Information Technology/Communications

A commercial IT/COMM system provides basic internet, telephone, and television services. A separate DoD system provides additional communications infrastructure to facilitate DoD operations. The IT/COMM systems typically consist of cables within buried conduit, encased in concrete, running between manholes/handholes. Commercial IT/COMM infrastructure currently services the existing facility. There is no commercial or DoD IT/COMM infrastructure in the immediate vicinity of the DOI replacement facility site. Existing IT/COMM utilities in the ROI are shown in Figure 3.11-1.

3.11.2 Environmental Consequences

The impact analysis for utilities compares the existing capacity and demand on a utility to the projected capacity and demand needed for the proposed action.

3.11.2.1 No-Action Alternative

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

3.11.2.2 Alternative 1

Electrical Power

Under Alternative 1, new electrical distribution lines needed for the proposed action would connect to the local DoD 3-phase 13.8 kilovolt overhead power distribution system, currently serving the Refuge and existing DOI facilities, through an existing power pole where Highway 3A and Perimeter Road meet. The replacement facility for the DOI facility would be connected to an existing power pole. The replacement facility for the DOI facility would also include a standby 200-kilowatt back-up power generator and associated equipment.

Existing users may experience short-term electrical power outages during construction and demolition activities as the DOI replacement facility is brought online and the old one disconnected. These potential outages would occur during daylight hours and be brief. These short-term electrical power disruptions from construction and demolition would have a negligible impact on the current system or customers. Advance notice of expected outages would be published in the local press to further minimize any inconvenience. Under Alternative 1, the replacement facility size would be approximately the same as the existing DOI facility, but the replacement facilities would be more modern and energy efficient than the existing facilities, so the overall electrical usage would be reduced. Therefore, the impact of Alternative 1 on the electrical utility system would be less than significant.

Potable Water

Under Alternative 1, the DOI replacement facility would be connected to the DoD potable water system with a new approximately 8-inch diameter water pipeline to the junction of Highway 3A and Perimeter Road to fill a new water storage tank at the DOI replacement facility. A new booster pump station would pressurize water from the tank to meet the domestic and fire-fighting demands. Water use during construction and occupation of the DOI replacement facility would not exceed the system capacity or result in any disruption of service for existing users. Demolition of the existing facility would have no impact on the existing DoD or GWA potable water systems as the current system utilizes a standalone water catchment system and a water pipeline that can be isolated. Therefore, Alternative 1 would have less than significant impact to potable water.

Wastewater

Under Alternative 1, portable toilets would be provided during construction and demolition activities. These toilets would be periodically emptied, with the sewage disposed of at an existing wastewater treatment plant (WWTP).

There is no wastewater collection system in the immediate vicinity of the DOI replacement facility site, thereby requiring a new standalone treatment system. The facilities construction site is outside the aquifer Groundwater Protection Zone, allowing for the development of an on-site system. The wastewater system of the DOI replacement facility would consist of an improved certified nitrogen reducing septic system that treats only domestic flows and a leach field. A holding tank would be constructed for non-domestic flows, which would be treated off-site.

During construction, the new wastewater system would be built and fully operational prior to abandonment of the existing system. All sewer lines and the septic tank would be thoroughly pressure cleaned and pumped before any abandonment would occur. Lines from the facility to the septic tank would be cut, capped, and abandoned in place. The septic tank would be removed completely and replaced with approved fill material. Leaching field lines would be cut, capped, and abandoned in place and lines 6-inch and larger would be filled with flowable fill prior to capping and abandonment. Following construction, because there is no change in the DOI operation or staffing of the Refuge, the estimated wastewater flow from the DOI replacement facility would not be appreciably different from the existing facility. Installation of the new septic and leach field system would result in improvements to the existing system. Therefore, Alternative 1 would result in minor beneficial impacts to wastewater.

Solid Waste

Under Alternative 1, the solid waste generation for construction of the DOI replacement facility and demolition of the existing facility would consist of debris typical of a small construction project. Suitable solid waste collection containers would be provided, and the solid waste would be periodically collected, handled, and disposed of similar to any construction project on Guam. The quantity and type of construction and demolition materials would determine the applicability of a solid waste permit and suitable transfer station for construction waste. A solid waste facility permit would be obtained from Guam Environmental Protection Agency prior to commencing activities. An integrated solid waste management plan would be prepared. Organic waste materials that can be diverted from a landfill would be managed separately, with green waste consisting of trees, stumps, leaves, and grass mulched and composted. All unrecycled waste would be disposed of at Layon Landfill or at the Naval Base Guam Landfill. Both landfills have the capacity for the construction and demolition waste resulting from Alternative 1. Because there is no change in the DOI operation or staffing of the Refuge, the estimated solid waste from the DOI replacement facility would not be appreciably different from the existing facility. Therefore, Alternative 1 would have less than significant impacts for solid waste.

Information Technology/Communications

Alternative 1 would require installation of new conduit duct banks to connect the DOI replacement facility to the new IT/COMM infrastructure being constructed as part of the LFTRC. The DOI replacement facility communication lines would be connected at Highway 3A, the closest point of connection to the new IT/COMMs system in the LFTRC. These hardwired connections of approximately two 4-inch diameter conduits would be trenched in for a length of approximately 8,000 feet. The conduits would be located along the existing roadways between the DOI replacement facility and the LFTRC, within disturbed areas, and entirely within the Refuge and AAFB property. The IT/COMMs for the replacement

facility would be constructed and operational prior to disconnecting the IT/COMMs utilities at the existing facilities. There is a potential for a one-time short duration outage during the new service tie-in. For these reasons, the impact of Alternative 1 to IT/COMMs system would be less than significant.

3.11.2.3 Alternative 2

Impacts to utilities for Alternative 2 would be similar to those described for Alternative 1. Alternatives 1 and 2 differ only in the size of the development area for the DOI replacement facilities (approximately 4.5 acres versus approximately 7.5 acres for Alternative 1), resulting in slightly less ground disturbance than under Alternative 1. There would no change in construction timing or personnel or final users of the DOI facilities between the two alternatives; therefore, impacts to utilities would be less than significant.

This page intentionally left blank.

4 Cumulative Impacts

This section defines cumulative impacts; identifies past, present, and reasonably foreseeable future actions; presents the predictable environmental trends associated with climate change; and analyzes the incremental effects the proposed action may have when combined with these past, present, and reasonably foreseeable actions.

4.1 Definition of Cumulative Impacts

Cumulative impacts are defined in 40 CFR 1508.1(i)(3) as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time."

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

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

4.2 Past, Present, and Reasonably Foreseeable Actions

Actions included in the cumulative impacts analysis are shown in Table 4-1 and Figure 4-1.

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

Index #	*Action*	*Year*	*Description*
1	Guam and CNMI Military Relocation	Final SEIS (2015)	• Relocation of Marine Corps forces on Guam to include the establishment of a LFTRC, cantonment area, family housing area, and associated infrastructure. The LFTRC Alternative 5 encompasses 4,016 acres in the Ritidian Point area and includes an SDZ over a portion of the Refuge.
2	Terminal High-Altitude Area Defense Permanent Stationing on Guam, AAFB	Final Supplemental EA (2021)	• Permanent stationing of a Terminal High-Altitude Area Defense battery on Guam at Camp Blaz South, including the expansion of the NWF CDZ at AAFB.
3	Munitions Storage Igloos at AAFB EA	Final EA (2020)	• Construct and upgrade 280,000 square feet of munitions storage capacity and associated infrastructure.

Index #	*Action*	*Year*	*Description*
4	Mariana Islands Training and Testing	Final EIS (2015)	• Ongoing training and testing DON activities at sea and on Farallon de Medinilla within the Mariana Islands Range Complex, areas on the high seas and transit corridor between the Mariana Islands Range Complex and the Hawaii Range Complex. Includes aircraft training activities at AAFB.
5	Enhanced Integrated Air and Missile Defense System on Guam	Final EIS Expected in 2025	• Deployment and operation of a combination of components from the MDA, Department of the Army, and DON that would be integrated for air and missile defense. These proposed components include missile defense radars and sensors, missile interceptor launchers, and command and control systems. Airspace modification may be necessary at sites where radars would be located.
6	Infrastructure Upgrades at AAFB North Ramp	Final EIS Expected in early 2025	• Infrastructure upgrades at AAFB in the North Ramp area, adjacent to the existing airfield operations. Infrastructure upgrades would occur adjacent to the existing airfield operations area and in MSA-1, totaling approximately 204 acres. Construction proposed for duration of 7 years beginning in 2025.
7	198-Megawatt Ukudu Power Plant Project	Under construction in 2023	• Construction of 198-megawatt power plant in the southern Dededo area near the Guam Regional Medical City. The new power plant would replace existing power plants in Cabras and would burn clean ULSD and natural gas instead of “heavy” fuel.
8	Firefighter Training Facility at MCB Camp Blaz, Finegayan	Final EA (2023)	• Construction and operation of a new Firefighter Training Facility at MCB Camp Blaz. Construction would include a six-story training tower, training mockups, vehicle course, and control facility.
9	Air National Guard Beddown for the Fifth SPCS Basing Actions AAFB, Guam	Final EA (2022)	• Construct and operate facilities for the beddown of a defensive ANG SPCS mission at AAFB, Guam. The proposed beddown would encompass an area approximately 5 acres in size near the Base Exchange and addition of between 62 and 105 ANG personnel. The proposed improvements would include the construction of a new administration building, maintenance area, hazardous storage area, equipment pad, parking lot, and air conditioner unit.

Index #	*Action*	*Year*	*Description*
10	JRM INRMP	Planned 2025	• This INRMP is focused on JRM-administered and leased terrestrial and submerged lands. The purpose of this INRMP is to maintain long-term ecosystem health and operational requirements of the DoD's mission while minimizing impacts to natural resources at JRM sites. The plan serves as a formal structure to integrate existing natural resources management programs, current projects, activities, and plans that have been incorporated into the INRMP. Priorities are based, in part, on annual requirements, environmental considerations, and mission support needs.

Notes: Project locations are shown by index number in Figure 4-1.

Legend: AAFB = Andersen Air Force Base; ANG = Air National Guard; CNMI = Commonwealth of the Northern Mariana Islands; DoD = Department of Defense; DON = Department of the Navy; EA =Environmental Assessment; EIS = Environmental Impact Statement; INRMP = Integrated Natural Resources Management Plan; JRM = Joint Region Marianas; LFTRC = Live Fire Training Range Complex; MCB = Marine Corps Base; MDA = Missile Defense Agency; NWF CDZ = Northwest Field Cargo Drop Zone; SDZ = Surface Danger Zone; SEIS = Supplemental Environmental Impact Statement; SPCS = Space Control Squadron; ULSD = Ultra-low Sulfur Diesel.

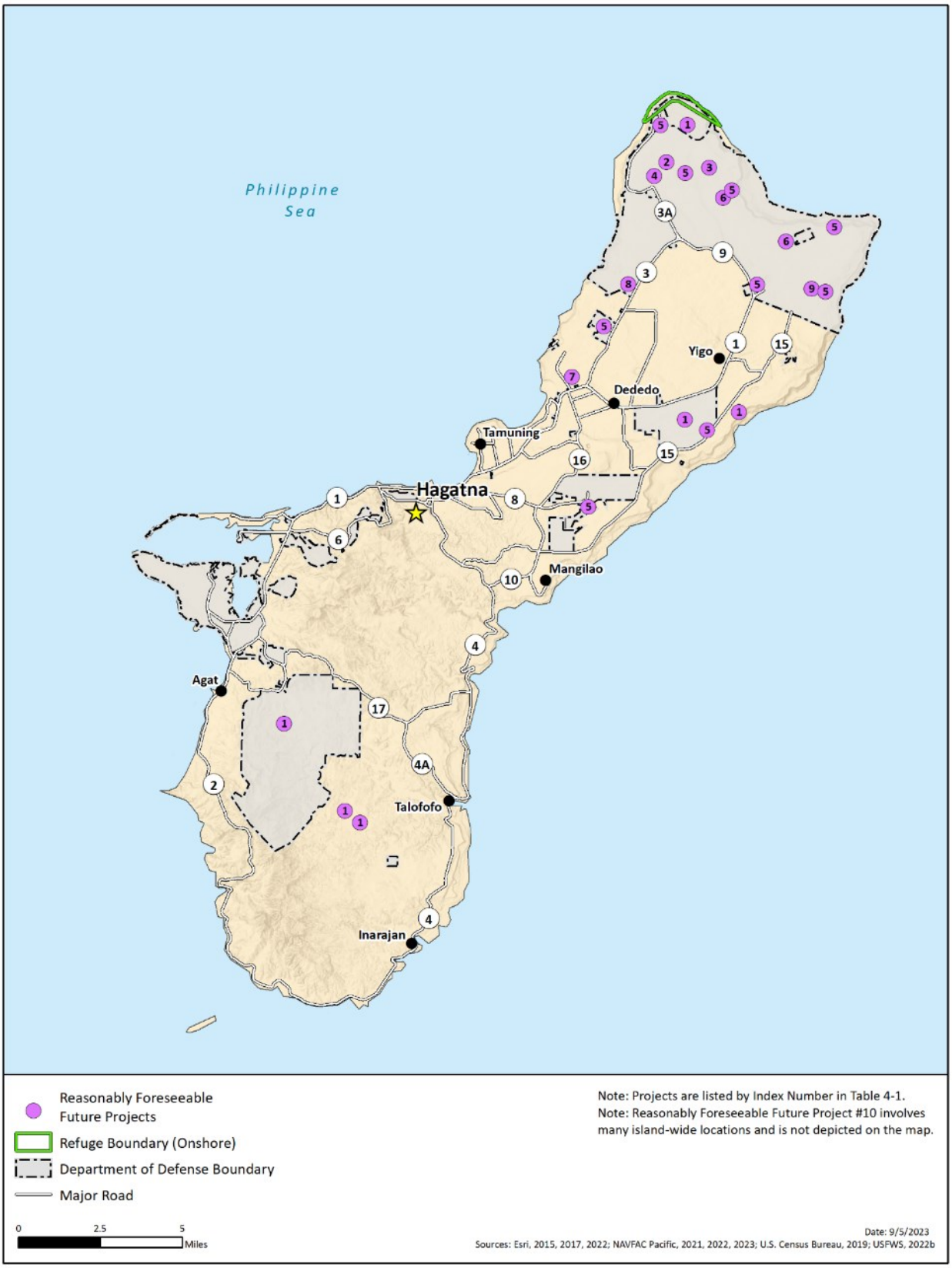


Figure 4-1 Locations of Past, Present, and Reasonably Foreseeable Actions

4.3 Cumulative Impact Analysis

4.3.1 Climate Change

Climate change is an environmental trend with wide ranging implications for the assessment of potential future environmental impacts. The existing climate conditions in the project area provide a baseline for the analysis of potential changes to the various resource areas associated with climate change. The existing climate conditions on Guam are representative of the existing climate conditions of the project area as summarized in Table 4-2.

On January 9, 2023, CEQ issued interim guidance on GHG emissions and climate change under NEPA. Under NEPA, when addressing climate change, agencies should consider the potential effect of a proposed action on climate change as indicated by assessing GHG emissions and the effects of climate change on a proposed action and its environmental impacts. Pursuant to EO 2019-19, *Relative to Creating the Climate Change Resiliency Commission*, the Governor of Guam created the climate change resiliency commission to develop an integrated strategy to build resiliency against the adverse effects of climate change and to reduce contributing factors such as greenhouse emissions. The Commission will develop and coordinate an effective, data-based response to climate change focusing on key climate change outcomes including GHG emissions and carbon footprint.

Table 4-2 Existing Climate Conditions on Guam

Predictable Trend	*Description*
Regional Temperature	The average annual air temperature is 83°F. Temperature ranges remain between 77°F and 88°F throughout the year.
Precipitation pattern	Rainfall averages between 84-116 inches (213-295 centimeters) per year. The rainy season is between the months of June through December. The dry season (January through May) can have 75 percent less rain than the rainy season.
Frequency and intensity of extreme weather events	The typhoon belt extends through the region. An average of three tropical storms and one typhoon passes within 180 nautical miles of Guam each year.
Elevation	Elevations on Guam range from sea level to 1,332 feet above sea level. The site of the proposed DOI replacement facilities is 60 feet above mean sea level and approximately 1,000 feet (0.2 mile) from the shoreline. The existing facilities proposed for demolition are at 15 feet elevation and less than 500 feet (0.1 mile) from the shoreline.
Sea Surface Temperatures	Average sea surface temperature is 83.5°F. Sea surface temperatures range from the warmest temperature in August of 85.3°F to the coldest temperature in February of 82°F.

Key: °F = degrees Fahrenheit; MCB = Marine Corps Base.
Source: Keener et al. 2015; World Sea Temperature, 2022.

Climate change is a global issue and trend resulting from collective emissions of GHGs with regional consequences. The latest science on climate change is summarized by numerous agencies, with the most prominent being the Intergovernmental Panel on Climate Change (IPCC). The Sixth Assessment Report is the most recent IPCC report, released in 2021. The Pacific Islands Regional Climate Assessment (PIRCA) released a report focused on Climate Change on Guam in 2020 (Grecni et al.).

Climate change is likely to negatively impact Guam. Potential long-term negative environmental impacts include sea level rise, increases in ocean temperature, increasing severity of storms and droughts due to changing weather patterns, increased hot days and lower overall rainfall, and changes to local ecosystems that could include the loss of species. Predictable environmental trends associated with

climate change for each resource are based on the PIRCA report (Grecni et al., 2020.). The PIRCA report provides various scenarios–future high, future low—and predictions for frequency of rainfall events and sea level rise. The predictable environmental trends associated with climate change identified in Table 4-3 were evaluated to determine their potential future effects on each resource evaluated in this EA, as well as the potential for additive impacts from the Proposed Action. Table 4-4 summarizes the predictable environmental trends for resources associated with climate change.

Table 4-3 Predictable Environmental Trends Associated with Climate Change Projected for Late Century

Predictable Trend	*Description*
Rising global temperatures (air/ocean)	Air temperatures have been increasing on Guam. Average air temperature is predicted to rise by between 2.7-6.3°F by 2100 (RCP 8.5). In the 1950s, 5 days per year exceeded 88°F. By the 1990s, this had increased to 36 days per year, and by 2100 Guam is projected to have 257 days over 90°F.
Change in precipitation patterns	Under the future high scenario presented in the PIRCA report average annual rainfall is projected to decrease 7% by 2100. Under this model the rainy season is predicted to see a 12% reduction while the dry season will see a 9% increase in rainfall. Decreased rainfall is expected to reduce rainfall recharge rates to the NGLA which will lead to increased groundwater salinity.
Increased frequency and/or intensity of extreme weather events	The Marianas region is expected to experience more frequent and intense extreme rainfall events. Drought conditions are projected to occur in four out of ten years on average by 2100. The number of typhoons that affect Guam is expected to decrease, however, tropical cyclone intensity is likely to increase. This is expected to lead to stronger storms. Future typhoons are likely to happen less often but be more severe and have greater impact.
Rising Sea Level and Associated Storm Surge	The sea level around Guam is rising at an average rate of 0.13 inches per year. Global MSL is projected to rise between 1 and 4.3 feet by 2100. The sea level rise on Guam is expected to be higher than the global average. A scenario of 3 feet of sea level rise will expose 58% of Gaum's infrastructure to impacts, predominantly in the South. Sea level rise is not expected to increase groundwater salinity in the NGLA (USGS, 2019).
Ocean Acidification	Ocean acidification has been slowly increasing since 1988 due to additional carbon dioxide in the atmosphere reacting with sea water. This increases the acidity of the ocean. Under projected warming, coral reefs around Guam will experience annual bleaching beginning in 2035.

Key: °F = degrees Fahrenheit; MSL = mean sea level; NGLA = Northern Guam Lens Aquifer; PIRCA = Pacific Islands Regional Climate Assessment; RCP = representative concentration pathway.

Sources: Grecni et al., 2020; USGS, 2019.

Table 4-4 Predictable Environmental Trends for Resources Associated with Climate Change

Predictable Trend	*Description*
Rising global temperatures (air/ocean)	Not applicable for most EA resources. No reasonably close causal relationships to most EA resources have been identified. The rise in global temperatures is causing instability in terrestrial ecosystems and could aid the spread of some invasive species. There could be increased risk of wildfire. Primary implications of rising temperatures on water resources in the ROI are potential increases in evapotranspiration which could result in decreased groundwater recharge. There may be increased risk of health issues from extreme heat. Low-income populations may be disproportionately impacted by rising global temperatures because they may have a greater sensitivity to impacts and lack the resources to mitigate impacts or help them adapt to changing environments. For hazardous materials: • Increases in temperature could increase volatilization of persistent organic chemicals, thereby causing greater concentrations to become airborne and travel longer distances. • Increases in temperature and changes in air moisture content may alter the persistence of chemicals. • Rising air temperatures may cause land surfaces to retain less moisture, allowing contaminated soil to readily become airborne. • Pesticides could volatilize more readily, and residues may also readily degrade in warmer soil and surface waters. • Volatiles could dissipate more readily, thereby possibly decreasing volatile concentrations in the air and ocean.
Change in precipitation patterns	Not applicable for most EA resources. No reasonably close causal relationships to most EA resources have been identified. Changes in precipitation patterns could impact the diverse microclimates on Guam, alter vegetation communities and habitat suitability for wildlife, aid the spread of some invasive species, and increase the risk of wildfire. According to the PIRCA report (2020), annual rainfall is expected to decrease 7% by 2100. This would have a negative impact on groundwater recharge in the NGLA. Decreases in rainfall could lead to more frequent drought conditions allowing contaminated soil to readily become airborne. Low-income populations may be disproportionately impacted by changes in precipitation patterns because they may have a greater sensitivity to impacts and lack the resources to mitigate impacts or help them adapt to changing environments. Drought events threaten food security and access to drinking water. Drought can lead to an increase in wind-blown dust events which negatively affects air quality. Floods and extreme precipitation can contaminate freshwater sources, heighten the risk of water-borne disease, and create breeding grounds for disease-causing insects. These events can increase the risk of drowning, injury or illness, and property damage and disrupt medical and health services.

Predictable Trend	*Description*
Increased frequency and/or intensity of extreme weather events	Increased frequency and/or intensity of extreme weather events could cause damage and destruction to facilities, cultural resources, natural vegetation that contribute to the existing project area. Extreme weather events have potential to destroy rare and endangered populations of plants and wildlife that have small population ranges and strict habitat requirements. Floods and extreme precipitation can increase contamination in freshwater sources. Floods and extreme precipitation can contaminate freshwater sources, heighten the risk of water-borne disease, and create breeding grounds for disease-causing insects. These events can increase the risk of drowning, injury or illness, and property damage and disrupt medical and health services. Increased frequency or intensity of typhoons could increase the potential for loss of life and property damage. Low-income populations may be disproportionately impacted by the increased frequency and/or intensity of extreme weather events because they may have a greater sensitivity to impacts and lack the resources to mitigate impacts or help them adapt to changing environments. For hazardous materials: • Flooding events could remobilize chemicals that were absorbed into soil and sediment. • Flooding could dilute pollutants due to increased water volume in surface water bodies. • Extreme weather events could cause increased erosion by wind and surface water. The runoff of contaminated soils and solids into stormwater drains could lead to further contamination of the ocean. • Increased catastrophic weather events may result in increased accidental releases of chemicals. • Hurricanes and high winds could damage buildings and chemical storage facilities and supporting auxiliary structures (i.e., pipelines). • Alternating floods and droughts have been reported to cause arsenic release and contamination into groundwater. • Droughts may decrease the leaching of metals and contamination of groundwater.
Rising Sea Level and Associated Storm Surge	Not applicable for most EA resources. No reasonably close causal relationships to EA resources have been identified. Rising sea levels could increase salinity in the NGLA, especially when compounded by decreasing recharge and increased groundwater pumping in the future. Rising sea levels could affect storage, management, and use of hazardous materials at the proposed project location, which is near sea level. Low-income populations may be disproportionately impacted by rising sea levels and associated storm surge because they may have a greater sensitivity to impacts and lack the resources to mitigate impacts or help them adapt to changing environments.
Ocean Acidification	Not applicable for most EA resources. No reasonably close causal relationships to EA resources have been identified. Low-income and indigenous populations may be disproportionately impacted by ocean acidification if certain species that are important to cultural practice or subsistence are impacted.

Key: % = percent; EA = Environmental Assessment; NGLA = Northern Guam Lens Aquifer; PIRCA = Pacific Islands Regional Climate Assessment; ROI = Region of Influence.

4.3.2 Terrestrial Biological Resources

The proposed action would have less than significant impacts to terrestrial biological resources, including physical disturbance and impacts associated with construction noise (see Section 3.2, *Terrestrial Biological Resources*). While a total of 11.94 acres of vegetation (10.75 acres within critical habitat) would be cleared for the proposed action, 5.02 acres within critical habitat would be enhanced for conservation benefit with the potential of an additional 2.10 acres that are not currently in critical habitat (at the demolition area), for a total of 7.12 acres of improved habitat once newly established vegetation matures. With the exception of the 2015 SEIS (Project #1), the projects in Table 4-1 involve ground-disturbing activities, but these activities are primarily located within the developed areas of AAFB and the nearby village of Dededo and do not contribute collectively to the impacts of the proposed action. They would not occur within the ROI. In addition, the types and magnitudes of terrestrial biological resources impacts (vegetation and wildlife) associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. For these reasons, implementation of the proposed action, when combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts to terrestrial biological resources within the ROI.

4.3.3 Cultural Resources

The proposed action would have less than significant impacts to cultural resources (see Section 3.3, *Cultural Resources*). No actions in Table 4-1 would include construction in the ROI, but construction associated with the 2015 SEIS would have potential impacts to approximately 31 historic properties elsewhere on Guam. The two NRHP-eligible archaeological sites in the ROI that may be affected by the proposed action consist of a large multi-component site that dates from the Latte to the Modern Periods and a site comprising six stone features with no associated artifacts. The age of this site is unknown but includes similar feature types as other archaeological sites on Guam that likely relate to post-Contact or historic native forest exploitation. Any impact would be fully mitigated under the 2011 PA. The types and magnitudes of cultural resources impacts (archaeological and architectural) associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. There would be no interaction between the proposed action and any action described in Table 4-1, and none of these projects would occur within the ROI. In addition, there would be less than significant impact to cultural resources from the proposed action due to adverse effects being minimized through Avoidance and Minimization Measures, including site design and planning. For these reasons, implementation of the proposed action when combined with the past, present, and reasonably foreseeable future projects would not result in significant impacts to cultural resources within the ROI.

4.3.4 Recreation

The proposed action would have less than significant impacts to recreation (see Section 3.4, *Recreation*). None of the actions in Table 4-1 would include construction in the Refuge or impact recreation within the Refuge. There would be no changes to USFWS or USGS missions on the Refuge. The new facilities and alternate access to the recreational resources within the Refuge would have no interaction with other cumulative actions occurring on Guam. The types and magnitude of recreation impacts associated with the proposed action are generally within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. However, whenever the SDZ is not activated, the proposed action would allow visitors to access recreational resources from

multiple points, creating a complete loop around the publicly accessible portions of the Refuge that was not identified in the SEIS. This new access loop would provide visitors with an additional option for accessing the recreational resources at the Refuge and would improve traffic flow on the Refuge when the SDZ is not active. An existing trail would be paved with one lane each way to provide for ingress and egress from the beach area and would be an improvement over the unpaved and unmarked Recreational Access Road currently used as a single option for ingress and egress only from the north. Furthermore, the proposed DOI facilities would be outside the SDZ, providing the public with access to educational opportunities whenever the Refuge is open, even when the SDZ is activated. For these reasons, implementation of the proposed action, when combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts to recreation within the ROI.

4.3.5 Visual Resources

The proposed action would have less than significant impacts to visual resources (see Section 3.5, *Visual Resources*). No actions in Table 4-1 would include construction in the ROI. In addition, the new facility is within an area of the Refuge completely isolated from any of the actions listed in Table 4-1. As such, there is no interaction between these sites and the proposed action. While some of the actions in Table 4-1 are near the Refuge on AAFB, they are approximately 1 mile southeast of the project area and at a much higher elevation and are not visible from any project KOPs. In addition, the military projects in Table 4-1 would only be visible to people within military bases and not to the public off base. Non-SEIS projects in Table 4-1 involve changes to visual resources, but these projects are primarily located within the developed areas of Andersen AFB and the nearby village of Dededo and are consistent with the visual character of those areas. The types and magnitudes of visual resources impacts associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. Finally, there would be no interaction between the proposed action and any action described in Table 4-1. In addition, there would be minimal impact to visual resources from the proposed action. For these reasons implementation of the proposed action, when combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts to visual resources within the ROI.

4.3.6 Socioeconomics

As described in Section 3.6, *Socioeconomics*, the proposed action is not expected to affect Guam's resident population or housing market; temporary positive effects to employment conditions and the economy would be less than significant; and any potential impacts to community cohesion would be less than significant. The actions in Table 4-1 include several large construction projects, some of which have been ongoing for years and several that could overlap the timing of the proposed action. Considered individually, these actions can also be expected to generate positive economic stimulus via direct expenditures for labor and building materials and the indirect and induced effects of such spending on other key industries and economic metrics. The local construction industry has rebounded far more quickly than other industries since the COVID-19 pandemic, thereby filling a larger-than-normal role in sustaining Guam's economy while tourism and related industries recover more slowly. However, since these projects collectively represent a higher-than-normal intensity of construction activity over an extended period, some negative cumulative effects have been recognized, including limited availability and higher costs of construction labor and materials, and delays and reduced capacity to implement other (non-military) construction projects such as residential housing (which has precluded expansion in the local housing supply and substantially increased prices). While the proposed action has the potential

to contribute to these cumulative effects, government and industry have adapted to the higher intensity of construction activity by expanding the supply of H-2B temporary workers to record levels, extending the ability to hire H-2B workers for non-military construction projects, and streamlining the planning and approval processes to facilitate development of temporary worker housing projects. These policy measures should continue to effectively address the cumulative impacts of the ongoing surge in military buildup construction. In addition, the types and magnitudes of socioeconomics impacts associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. For these reasons, implementation of the proposed action, combined with the past, present, and reasonably foreseeable future projects, would have a less than significant cumulative effect on socioeconomics within the ROI.

4.3.7 Environmental Justice

The population of Guam qualifies as a community with environmental justice concerns based on the proportions of residents that meet the definitions of minority and low-income census categories, and a proportion of children that is higher than in the reference population. Regarding the minority and low-income categories, none of the resource impacts would disproportionately affect the visiting public at the Refuge, none of the impacts would disproportionately affect communities with environmental justice concerns, and all impacts of the proposed action would be less than significant, so they would not contribute to cumulative environmental justice effects (see Section 3.7.2). Impacts associated with the actions listed in Table 4-1 have no relation to nor would in any manner affect children visiting the ROI. In addition, the types and magnitudes of environmental justice impacts associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. Therefore, implementation of the proposed action would not contribute to cumulative environmental justice effects when combined with the past, present, and reasonably foreseeable future projects.

4.3.8 Noise

The proposed action would have less than significant noise impacts (see Section 3.8, *Noise*). No actions in Table 4-1 would include construction in the ROI. Some actions in Table 4-1 would include the use of construction equipment that would result in increased temporary intermittent noise levels. However, these would result in short-term increases in daytime noise, and construction noise levels often would not exceed existing noise levels from nearby roadways or other sources (e.g., aircraft operations at AAFB). In addition, the projects in Table 4-1 would occur outside the ROI and would not overlap with construction from the proposed action. No other projects would occur within the ROI. None are likely to exceed federal or local noise level thresholds for compatible land uses beyond the property boundary. The types and magnitudes of noise impacts associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. The Guam military relocation (specifically the LFTRC and Northwest Field components) would cause noise impacts, and there are ongoing training activities at Northwest Field that contribute to the noise levels in the vicinity. However, no additive impacts were identified on private residences outside of AAFB. In addition, there would be minimal noise impacts from the proposed action. For these reasons, implementation of the proposed action, when combined with the past, present, and reasonably foreseeable future projects, would not result in significant noise impacts within the ROI.

4.3.9 Water Resources

The proposed action would have less than significant impacts to water resources (see Section 3.9, *Water Resources*). The actions in Table 4-1 would not include construction in the ROI and would not increase the amount of impervious surface in the ROI. There is no interaction between the Table 4-1 projects and the proposed action. None of the other projects in Table 4-1 identified any significant impact to water resources. The types and magnitudes of water resources impacts associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. In addition, daily water demand of all projects combined was found to be well below the capacity of the NGLA aquifer. Finally, there would be no interaction between the proposed action and any action described in Table 4-1; none of the projects would occur within the ROI. For these reasons, implementation of the proposed action, when combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts to water resources within the ROI.

4.3.10 Geology and Soils

The proposed action would have less than significant impacts to geology and soils (see Section 3.10, *Geology and Soils*). The actions in Table 4-1 would not include construction in the ROI and would not overlap with ground-disturbing activities associated with the proposed action. As a result, the magnitude of additive impact to geology and soils resulting from the proposed action as compared to the other actions in Table 4-1 would be minimal and would not impact the overall geological resources on Guam. In addition, the types and magnitudes of geology and soils impacts associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. Moreover, several activities and projects would have a beneficial impact on geology and soil resources both now and in the future. Finally, there would be no interaction between the proposed action and any action described in Table 4-1. In addition, there would be minimal impact to geology and soils from the proposed action. For these reasons, implementation of the proposed action, combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts to geology and soils within the ROI.

4.3.11 Utilities

The proposed action would have less than significant impacts to utilities (see Section 3.11, *Utilities*). No actions in Table 4-1 would include construction in the ROI. With regards to capacity, none of the utilities (power, water, wastewater, solid waste, and IT/COMM) servicing the ROI or the other projects in Table 4-1 are at capacity. The proposed action would not contribute to a change in demand on water production in the central and northern parts of Guam that come from water wells fed by the NGLA. Non-SEIS projects in Table 4-1 include a power plant project that would improve power generation and distribution in northern Guam. In addition, the types and magnitudes of impacts to utilities associated with the proposed action are within the anticipated level of impact identified in the SEIS impact analysis (DON 2015) for project components at or near Ritidian Point. Consequently, actions identified in Table 4-1 would not individually or collectively exceed the capacity of the various utility systems. In addition, there would be minimal impact to utilities from the proposed action. For these reasons, implementation of the proposed action, when combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts to utilities within the ROI.

Appendix A: 2020 Memorandum of Agreement

This page intentionally left blank.

MEMORANDUM OF AGREEMENT
BETWEEN
THE DEPARTMENT OF THE INTERIOR
AND
THE DEPARTMENT OF THE NAVY
FOR
MANAGEMENT OF THE RITIDIAN UNIT OF THE GUAM NATIONAL WILDLIFE REFUGE, THE U.S. GEOLOGICAL SURVEY BROWN TREESNAKE RESEARCH AND RAPID RESPONSE FACILITIES, AND OPERATION OF OVERLAPPING SURFACE DANGER ZONES

I. PURPOSE

The Department of the Interior (DOI), through authorities delegated from the Secretary to the Director of the U. S. Fish and Wildlife Service (FWS) and the Director of the U. S. Geological Survey (USGS), enters into this Memorandum of Agreement (MOA) with the Department of the Navy (DON) (jointly, DOI and DON are the Parties), to document the commitments, both individual and collective, of the Parties providing for the establishment and operation of surface danger zones (SDZ) which overlay a portion of the Ritidian Unit of the Guam National Wildlife Refuge (GNWR) and the USGS Brown Treesnake Research and Rapid Response (BTS RRR) facilities.

II. AUTHORITY

This MOA is hereby made and entered into by and between the Parties under the authority of section 2822 (*Establishment of Surface Danger Zone, Ritidian Unit, Guam National Wildlife Refuge*) of the National Defense Authorization Act for Fiscal Year 2015, Public Law 113-291 (hereinafter "FY15 NDAA"), and in accordance with the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd) and the Cooperative Agreements between the U.S. Navy, the U.S. Air Force, and the U.S. Fish and Wildlife Service (USFWS) for the establishment and management of the Guam National Wildlife Refuge, Guam. This MOA is additionally made and entered into by and between the Parties under the authority of section 316 (*Comprehensive Program for the Eradication of the Brown Treesnake Population from Military Facilities in Guam*) of the National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417 ("FY09 NDAA").

III. OBJECTIVES

The objectives of this MOA are to accommodate:

A. The operation of a live-fire training range complex (LFTRC) on Andersen Air Force Base-Northwest Field; and

B. The on-going management of the adjacent GNWR Ritidian Unit by the USFWS.

C. The on-going operation of the USGS BTS RRR facilities.

IV. ACKNOWLEDGEMENTS AND BACKGROUND

The Parties acknowledge that:

A. Section 2822 of the FY15 NDAA provides that this MOA shall include measures to maintain the purposes of the Ritidian Unit. The NDAA states:

(a) Agreement to Establish -- "In order to accommodate the operation of a live-fire training range complex on Anderson Air Force Base-Northwest Field and the management of the Ritidian Unit of the Guam National Wildlife Refuge, the Secretary of the Navy and the Secretary of the Interior, notwithstanding the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd et seq.), may enter into an agreement providing for the establishment and operation of a surface danger zone which overlays the Ritidian Unit or such portion thereof as the Secretaries consider necessary."

(b) Elements of Agreement – The agreement to establish a surface danger zone over all or a portion of the Ritidian Unit of the Guam National Wildlife Refuge shall include --

(1) "measures to maintain the purposes of the Refuge; and"
(2) "as appropriate, measures, funded by the Secretary of the Navy from funds appropriated after the date of enactment of this Act and otherwise available to the Secretary, for the following purposes:"
(A) "Relocation and reconstruction of structures and facilities of the Refuge in existence as of the date of the enactment of this Act."
(B) "Mitigation of impacts to wildlife species present on the Refuge or to be reintroduced in the future in accordance with applicable laws"
(C) "Use of Department of Defense personnel to undertake conservation activities within the Ritidian Unit normally performed by Department of the Interior personnel, including habitat maintenance, maintaining the boundary fence, and conducting the brown tree snake eradication program."
(D) "Openings and closures of the surface danger zone to the public as may be necessary."

B. The GNWR Comprehensive Conservation Plan (CCP) sets forth the following purposes for which the GNWR Ritidian Unit was established (excerpts only):

1. ". . . to conserve (A) fish or wildlife which are listed as endangered species or threatened species . . . or (B) plants . . ." 16 U.S.C. § 1534 (Endangered Species Act of 1973).

2. ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . ." 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956).

3. ". . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" 16 U.S.C. § 715d (Migratory Bird Conservation Act).

4. ". . . suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resource, (3) the conservation of endangered species or threatened species . . ." 16 U.S.C. § 460k-1 (Refuge Recreation Act).

C. The Parties share common goals for the recovery of endangered and threatened species, the protection of native flora and fauna, the conservation of unique ecosystems, and the maintenance of native biological diversity on Guam.

D. The GNWR Ritidian Unit consists of 1218 acres (385 acres of land and 833 acres of submerged land) under the custody and control of the USFWS. The DON reported these lands as excessed to the General Services Administration (GSA) on October 9, 1992, for the express purpose of establishing a National Wildlife Refuge at Ritidian Point. The GSA transferred the land to DOI on July 6, 1993, and the submerged land to DOI on May 17, 1996. The transfer documents refer to 772.1 acres (370.6 acres of land and 401.5 acres of submerged land). However, sonar surveys by NOAA have resulted in a more accurate location of the 30-meter isobath, which is the seaward boundary of the submerged lands. USFWS land records are being updated to reflect this better estimate of the Ritidian Unit acreage.

E. The U.S. Fish and Wildlife Service completed a CCP and Environmental Assessment for the Guam NWR on September 30, 2009. The CCP is intended to guide the management of the Refuge for 15 years.

F. On April 27, 2012, the U.S.-Japan Security Consultative Committee (SCC) issued a joint statement announcing its decision to adjust the plans outlined in the May 2006 Realignment Roadmap for the relocation of U.S. Marines to Guam. In accordance with the SCC's adjustments, the DoD adopted a new force posture in the Pacific providing for a materially smaller force on Guam. Specifically, the adjustments include reducing the originally planned relocation to Guam of approximately 8,600 Marines and 9,000 dependents to a force of approximately 5,000 Marines and approximately 1,300 dependents.

G. On August 28, 2015, following preparation of an Environmental Impact Statement, the DON issued a Record of Decision selecting Andersen Air Force Base-Northwest Field as the location for an LFTRC. The LFTRC will ensure the relocating U.S. Marines are organized, trained, and equipped consistent with 10 U.S.C § 5063, satisfy individual live-fire training requirements, and enable the U.S. Government to establish an operational U.S. Marine Corps presence in Guam in accordance with April 27, 2012 Joint Statement of the U.S.-Japan SCC.

H. LFTRC SDZs will overlay a portion of the GNWR Ritidian Unit. The SDZs are required by Marine Corps Order 3570.1C to ensure the safe operation of the LFTRC at Andersen Air Force Base-Northwest Field. The SDZ for the multi-purpose machine gun range (MPMG) (the largest and westernmost LFTRC range) overlays the access road to the GNWR Ritidian Unit and existing GNWR facilities used by USFWS and USGS staff. The SDZ overlapping facilities would include GNWR Ritidian Point Visitor Center, USFWS and USGS offices, laboratories and maintenance facilities, USGS animal holding facilities and outdoor animal testing enclosures.

I. The Marine Corps estimates the LFTRC will be used up to 39 weeks/year and cannot provide any additional scheduling information and timelines until the ranges become operational.

J. USFWS and USGS have noted they would be unable to meet the purposes of the GNWR Ritidian Unit and conduct the USGS BTS RRR without:

   a. The replacement of facility requirements at the GNWR Ritidian Unit to a location within the Refuge that is not within the SDZs, and;
   b. DON permanently providing funding for USFWS personnel requirements to account for the additional costs, such as staff inefficiencies, consistent with NDAA 2822(b)(2) caused by the operation of the SDZs.

V. COMMITMENTS OF THE PARTIES

A. The Parties together agree:

1. To identify range scheduling Points of Contact (POCs) who will coordinate USFWS, USGS, DON and public access to the GNWR Ritidian Unit; and
2. To carry out the roles and responsibilities assigned to them in this MOA.
3. To compensate for the additional burden driven by operation of the LFTRC and associated SDZs, DON will provide funding to DOI to hire employees and to offset additional costs to manage the GNWR occasioned by operation of the SDZs. The DON and DOI will identify and mutually agree on these costs caused by the DON operation of the LFTRC, and the associated number and role of the employees to be funded by DON. Initially, the DON agrees to provide funding up to $150,000 in FY22 and up to $350,000 in FY23 to cover the cost of hiring full time equivalents (FTEs) to address the additional costs caused by the operation of the first four LFTRC ranges. Thereafter, on an annual basis, the DON and DOI will review the costs associated with the operation of the LFTRC at the annual formal range scheduling review (see Section VI below). The review will take into account the extent to which the USFWS is staffed to meet baseline GNWR CCP requirements. The review will be used to make adjustments, if required and mutually agreed upon by the parties, to funding, functions, and processes established in this MOA. The parties envision initial FTEs will focus on range scheduling and law enforcement, with subsequent FTEs focused on scientific or biological functions.

B. The DOI will:

1. Retain responsibility for the continued operation and management of the GNWR Ritidian Unit;
2. Continue management activities to meet the purposes for which the GNWR Ritidian Unit was established and to meet the 10 goals outlined in the CCP;
3. Continue operation of the USGS BTS RRR on Guam;
4. Provide DON access to the GNWR Ritidian Unit to install and maintain signage at the boundary of the SDZs and conduct any other activities required as part of this MOA;
5. Participate in weekly, quarterly and annual range scheduling meetings hosted by the DON, review and verify quarterly published range schedules, and be responsible for requesting any modifications to the range schedule through the Marine Corps Range Control Office (RCO). The DON-funded USFWS Range Scheduling POC will:
    a. Acquire a Range Facility Management Support System (RFMSS) account from the DON, and receive training and maintain proficiency on the use of the account;

b. Provide timely requests for access to the SDZ-encumbered portion of the GNWR Ritidian Unit to the DON;
c. Provide timely cancellations of requested access if it is no longer needed to the DON in order to provide opportunity for DON to reschedule use of the range; and
d. Coordinate with and represent USGS staff from the USGS BTS RRR efforts within the SDZ encumbered portion of the GNWR Ritidian Unit relative to DON training;

6. Collaborate and support DON efforts to identify, analyze, and implement alternative access to the GNWR Ritidian Unit recreational areas outside the SDZs to support continued public use and minimize access impacts;
7. Provide public access to beaches, trails, and cultural properties during normal business hours consistent with the CCP and when the LFTRC is not being used and when the USFWS does not otherwise close the GNWR Ritidian Unit for reasons related to its operations; and
8. Work collaboratively with the DON to complete all necessary consultations in a timely manner to support actions undertaken as a result of the establishment of the SDZs. These actions will include development of alternative beach access routes and construction of replacement administration and research facilities and a visitor center.

C. The DON will:

1. Manage all range operations associated with the LFTRC on Andersen Air Force Base-Northwest Field;
2. Be responsible for establishing and implementing all range safety regulations required by Marine Corps Order (MCO) 3550.10 (Policies and Procedures for Range and Training Area Management), which will include provisions for public closures of portions of the GNWR Ritidian Unit while the ranges are in use.
    a. Coordinate with DOI when situations arise in which it becomes necessary for DOI personnel to exercise their law enforcement authority within the GNWR Ritidian Unit in support of DON's use of the LFTRC.
    b. Supply, install, maintain, and replace signs and other SDZ barrier controls within the GNWR Ritidian Unit that are required to meet the range safety standards in MCO 3570.1C (Range Safety).
3. In accordance with MCO 3550.10, establish a range scheduling process. Specifically,
    a. Establish the training schedule for the LFTRC. The DON will work closely with DOI to accommodate access requests to the area encompassed by the SDZs prior to establishing the schedule;
    b. Host range scheduling meetings:
        i. Weekly meetings between the RCO and the designated DOI range scheduling POC to review the upcoming range schedule for the next three

Page | 6

(3) months. At this meeting, DOI access requests will be reviewed and expected LFTRC down-time identified;

ii. Host quarterly range scheduling meetings;

iii. Host an annual range scheduling meeting to produce a general use and access schedule and adjust range scheduling coordination processes as needed;

c. Allow the DOI range scheduling POC access to the daily operational range schedule via RFMSS; and

d. If last minute cancellations/changes in the training schedule occur and portions of the GNWR Ritidian Unit under the SDZs can be opened for access, the RCO will notify DOI range scheduling POC.

4. Endeavor to provide the maximum practicable access to the GNWR Ritidian Unit, consistent with the accomplishment of training requirements;
5. Provide the USGS BTS RRR 24/7 access to the 5-hectare Closed Population Facility on Northwest Field, located behind the range and outside the SDZs;
6. Build permanent replacement office, visitors' area, maintenance, research facilities, and any other facilities DON and DOI agree are commensurate with those impacted by the SDZs. Construction of permanent facilities must be initiated one year prior to live fire training commencing on the MPMG. The exact scope of new facilities required will be determined based on a joint review of existing facility options as well as the required need.

   a. Prior to construction and use of new facilities, DON will comply with all applicable laws and regulations, including the National Environmental Policy Act, Endangered Species Act, and the National Historic Preservation Act, among others;

   b. If permanent facilities are not completed when training on the MPMG commences, DON will provide adequate temporary facilities for the Refuge and BTS functions.

   c. In order to minimize adverse effects to designated critical habitat on the Refuge from construction of the new permanent facilities, DON will demolish the existing DOI facilities, remove demolition debris, and prepare the site for restoration and regeneration. Preparation of the site by the DON will consist of clearing and grading, delineation of the habitat area, and an initial planting of native vegetation including the translocation of native plants from the new facilities construction area or from DON nursery stock (if available). Once site preparation is complete, habitat management will be the responsibility of DOI. Both DON and DOI recognize that this conservation measure will be linked to the DON proposed action for construction of new permanent DOI facilities within the Refuge.

Page | 7

d. Upon completion, DON will transfer the permanent facilities to DOI via execution of a DD Form 1354, and have no further responsibility for these DOI facilities. Thereafter, DOI will assume full responsibility for the facilities, including utilities, maintenance and upkeep.

7. Identify and construct alternative access to the recreational portion of the GNWR Ritidian Unit outside the SDZs to support continued public use consistent with the purposes of the Refuge and the LFTRC.
   a. Prior to construction and implementation of the alternative access, DON will comply with all applicable laws and regulations as described above in C(6)(a).
   b. DOI agrees to make available Refuge land at no cost to DON and facilitate approvals consistent with C(6)(a) in the siting and construction of the alternative access.

VI. REVIEW AND EVALUATION

The Marine Corps RCO and the designated DOI range scheduling POC will maintain open and continuous communication, including weekly, quarterly, and annual range scheduling meetings, as described under C(3)(b). As part of the annual range scheduling meeting, the DON and DOI will review the functionality and efficiency of the processes set forth in this MOA. The Parties will use these meetings to identify any problems and make appropriate adjustments. This may include adjustments to scheduling procedures, DON funded DOI positions and inefficiencies, and funding amount.

VII. DISPUTE RESOLUTION

A. The Parties shall make every effort to resolve any disagreements in carrying out actions under this MOA through staff-to-staff coordination, discussions, and information-sharing. The Parties shall attempt to resolve any disputes requiring action at the staff level as quickly and effectively as possible. If the Parties and their immediate supervisors are unable to resolve an issue, in a timeframe and manner necessitated by the dispute, the Parties commit to the following protocol for resolving the dispute at the lowest level possible. Use of this protocol includes instances where a Party believes there is a default in the obligations owed pursuant to this MOA by the other Party.

   1. Local Level Resolution Group: If a disputed issue cannot be resolved by the Parties' Primary POCs, the highest-ranking DON, FWS, and USGS official on Guam, with authority over the issues subject to the dispute, will attempt to find resolution to the dispute at the local level.

   2. Regional Level Resolution Group: If a resolution at the local level is unsuccessful, the issue will be elevated to either the Chief of Naval Operations

(appropriate designation) if a Navy Issue, or Headquarters Marine Corps (Installation & Logistics) if a Marine Corps issue, and to the Regional Directors of FWS and USGS or their designee.

3. National Level Resolution Group: If a resolution at the regional level is unsuccessful, the issue will be elevated to the National Level Resolution Group, comprised of, at a minimum, a representative from the DON Secretariat, the FWS Director or his/her designee, and the USGS Director or his/her designee, for final resolution.

B. The Parties agree the use of this Resolution Group process, as established in Section VII. A. of this MOA, is to ensure all disputes arising under this MOA are resolved in a timely manner. All requests for a dispute resolution at any level should include:

1. A concise summary of the issues in dispute and decisions that need to be made;

2. A statement of each of the Parties' position on each disputed issue;

3. All appropriate supporting rationale and documentation necessary for reaching a decision, including a copy of the MOA with provisions relevant to the dispute highlighted; and

4. A brief chronology of any actions already taken to resolve the dispute.

C. Resolution of disputes should be pursued as quickly as possible, and elevated to the next level as soon as it becomes apparent that the dispute will not be resolved at the level then reviewing the dispute. In no event should a review level take more than 30 days seeking to reach resolution of a dispute.

VIII. MODIFICATIONS, INTERPRETATIONS, ENFORCEABILITY AND TERMINATION

A. Changes, modifications and/or amendments to this MOA may be made at any time upon mutual written consent of the Parties. With regard to the Parties, no oral statement by any person and no written statement by anyone other than the undersigned, or an authorized representative as designated in writing, shall be interpreted as modifying or otherwise affecting the terms of this MOA.

B. This MOA is not intended to nullify or supersede any existing agreement between or among the Parties. Agreements that have been previously executed for DOD and DOI actions on the Ritidian Unit on the island of Guam shall continue to apply for the circumstances for which they were developed.

Page | 9

C. The Parties agree this MOA is limited to the authority set forth in section 2822 of the FY15 NDAA, does not expand or alter the scope of the Parties' respective authorities, and shall not be construed to create any legal obligation on the part of either agency or any private right or cause of action for or by any person or entity.

D. Performance under this MOA by the Parties is dependent upon lawful appropriation, availability, and allocation of funds by proper authorities. Nothing herein shall constitute nor be considered to constitute an obligation or expenditure of funds in advance of or in excess of a proper appropriation by Congress of the United States or otherwise be in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341 et seq.

E. Except as otherwise required by law, any documents or data exchanged between the Parties will not be released to a third party unless the designated representative of the Party that generated the document or data approves the release. The Parties agree to consult with each other prior to the release of any such documents or data pursuant to such lawful authority, or refer such documents and data to the appropriate Party for the release determination if permitted under the relevant legal authority.

F. Termination of the MOA

1. The MOA can only be terminated by mutual agreement of the Parties.

IX. SIGNATORIES

_____ Date: 5/14/2020
Director, U.S. Fish and Wildlife Service
Department of the Interior

_____ Date: _____
Director, U.S. Geological Survey
Department of the Interior

_____ Date: _____
Deputy Assistant Secretary of the Navy (Environment)
Department of the Navy

C. The Parties agree this MOA is limited to the authority set forth in section 2822 of the FY15 NDAA, does not expand or alter the scope of the Parties' respective authorities, and shall not be construed to create any legal obligation on the part of either agency or any private right or cause of action for or by any person or entity.

D. Performance under this MOA by the Parties is dependent upon lawful appropriation, availability, and allocation of funds by proper authorities. Nothing herein shall constitute nor be considered to constitute an obligation or expenditure of funds in advance of or in excess of a proper appropriation by Congress of the United States or otherwise be in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341 et seq.

E. Except as otherwise required by law, any documents or data exchanged between the Parties will not be released to a third party unless the designated representative of the Party that generated the document or data approves the release. The Parties agree to consult with each other prior to the release of any such documents or data pursuant to such lawful authority, or refer such documents and data to the appropriate Party for the release determination if permitted under the relevant legal authority.

F. Termination of the MOA

1. The MOA can only be terminated by mutual agreement of the Parties.

IX. SIGNATORIES

_____ Date: _____
Director, U.S. Fish and Wildlife Service
Department of the Interior

_____ Date: 14 May 20
Director, U.S. Geological Survey
Department of the Interior

_____ Date: _____
Deputy Assistant Secretary of the Navy (Environment)
Department of the Navy

C. The Parties agree this MOA is limited to the authority set forth in section 2822 of the FY15 NDAA, does not expand or alter the scope of the Parties' respective authorities, and shall not be construed to create any legal obligation on the part of either agency or any private right or cause of action for or by any person or entity.

D. Performance under this MOA by the Parties is dependent upon lawful appropriation, availability, and allocation of funds by proper authorities. Nothing herein shall constitute nor be considered to constitute an obligation or expenditure of funds in advance of or in excess of a proper appropriation by Congress of the United States or otherwise be in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341 et seq.

E. Except as otherwise required by law, any documents or data exchanged between the Parties will not be released to a third party unless the designated representative of the Party that generated the document or data approves the release. The Parties agree to consult with each other prior to the release of any such documents or data pursuant to such lawful authority, or refer such documents and data to the appropriate Party for the release determination if permitted under the relevant legal authority.

F. Termination of the MOA

1. The MOA can only be terminated by mutual agreement of the Parties.

IX. SIGNATORIES

_____ Date: _____
Director, U.S. Fish and Wildlife Service
Department of the Interior

_____ Date: _____
Director, U.S. Geological Survey
Department of the Interior

_____ Date: 5/14/2020
Deputy Assistant Secretary of the Navy (Environment)
Department of the Navy

Appendix B: Relevant Laws, Regulations, and Policies

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

- Archaeological and Historic Preservation Act (54 United States Code [U.S.C.] 312501–312508)
- Archaeological Resources Protection Act (16 U.S.C. 470aa–470mm)
- Clean Air Act (42 U.S.C. Sections 7401–7671q)
- Clean Water Act (33 U.S.C. Section 1251 et seq.)
- Coastal Zone Management Act (16 U.S.C. Section 1451 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. Section 9601 et seq.)
- Endangered Species Act (16 U.S.C. Section 1531 et seq.)
- Executive Order (EO) 11988, Floodplain Management (42 Federal Register 26951)
- EO 11990, Protection of Wetlands (42 Federal Register 26961)
- EO 12088 as amended, Federal Compliance with Pollution Control Standards
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks
- EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, and the Migratory Bird Treaty Act (66 Federal Register 3853, 16 U.S.C. sections 703–712)
- EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis (86 Federal Register 7037)
- EO 14008, Tackling the Climate Crisis at Home and Abroad (86 Federal Register 7619)
- EO 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability (88 Federal Register 70935)
- Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. Section 136 et seq.)
- Guam Administrative Rules, Chapter 7, Section 7130, Water Resources Development and Operating Regulations
- Guam Air Pollution Control Act (10 Guam Code Annotated [GCA] GCA Health and Safety, Chapter 49)
- Guam Safe Drinking Water Act (10 GCA Health and Safety, Chapter 53)
- Marine Corps Environmental Compliance and Protection Program (Marine Corps Order 5090.2)
- Migratory Bird Treaty Act (16 U.S.C. Section 703 et seq.)
- National Historic Preservation Act of 1966, as amended (54 U.S.C. 100101); Programmatic Agreement Among the Department of the Navy (DON), The Advisory Council on Historic Preservation, The Guam State Historic Preservation Officer, and CNMI State Historic Preservation Officer Regarding the Military Relocation to the Islands of Guam and Tinian
- Policies and Responsibilities for Implementation of the National Environmental Policy Act Within the Department of the Navy (32 Code of Federal Regulations [CFR] part 775)
- National Environmental Policy Act (NEPA); Council on Environmental Quality (CEQ) NEPA implementing regulations; DON procedures for implementing NEPA (42 U.S.C. Section 4331; 40 CFR parts 1500–1508; 32 CFR part 775)
- National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (88 Federal Register 1196)
- Noise Control Act (42 U.S.C. Section 4901 et seq.)
- Resource Conservation and Recovery Act (42 U.S.C. Section 6901 et seq.)

- Safe Drinking Water Act (42 U.S.C. Section 300f et seq.)
- Toxic Substances Control Act (15 U.S.C. sections 2601 et seq.)

Appendix C: Public and Agency Participation

To Be Provided in the Final EA.

This page intentionally left blank.

Appendix D: National Historic Preservation Act Section 106 Consultation

To Be Provided in the Final EA.

This page intentionally left blank.

Appendix E: Endangered Species Act Section 7 Consultation

E.1 Vegetation/Land Cover Acreage Values and Calculations

Table E-1 provides acreage values for vegetation and land cover for the proposed action components as referenced throughout Section 3.2, *Terrestrial Biological Resources*.

Table E-1 Vegetation/Land Cover Acreage Values and Calculations

Project Component	Within Critical Habitat Boundary	Line #	Vegetation/Land Cover Type	Acres
Access Road and Utility Re-alignment in Critical Habitat (extension of Hwy 3A and unimproved parking area)[1]	Yes	1	Road (**Disqualified from CH**)	0.60
		2	Mixed Limestone Forest-Foreslope	2.20
Recreational Beach Access Road (**no impacts**)	Yes	3	Coconut Forest	0.44
		4	Mixed Herbaceous Scrub	0.01
Recreational Beach Access Road Turnaround (other side of jeep trail) (**no impacts**)	Yes	5	Coconut Forest	0.07
Culvert	Yes	6	Coconut Forest	0.08
		7	Mixed Limestone Forest-Foreslope	0.08
Alternative Sites Focus Area[1]	Yes	8	Road (**Disqualified from CH**)	0.58
		9	Mixed Limestone Forest-Foreslope (Alt 1)	6.93
		10	Mixed Limestone Forest-Foreslope (Alt 2)	3.93
Jeep Road and Turn Around	Yes	11	Coconut Forest	0.61
		12	Mixed Limestone Forest-Foreslope	0.27
Utility Re-alignment in Critical Habitat (utilities along Hwy 3A) [1]	Yes	13	Road (**Disqualified from CH**)	2.12
		14	Mixed Limestone Forest-Foreslope	0.59
Utility Re-alignment (utilities along Hwy 3A) [1]	No	15	Road **(Disqualified from CH)**	3.19
		16	Hibiscus - Ochrosia Scrub	0.15
		17	Hibiscus-Leucaena	0.15
		18	Mixed Limestone Forest-Foreslope	0.61
Utility Re-alignment (utilities off of Hwy 3A)	No	19	Mixed Limestone Forest-Foreslope	0.28
Demolition/Site Preparation Area[1]	Yes	20	Buildings and Walkways **(Disqualified from CH)**	0.69
		21	Parking Lots **(Disqualified from CH)**	0.73
		22	Landscaped Area **(Disqualified from CH)**	2.10
Netted Area (Eastern side of the Refuge)	Yes	23	Mixed Limestone Forest-Foreslope	3.44
Netted Area (Eastern side of the Refuge)	Yes	24	Mixed Limestone Forest-Foreslope	1.26
Netted Area (South of proposed new facilities)	Yes	25	Mixed Limestone Forest-Foreslope	0.32
Netted Area (Demolition area containing nature center and parking lot)[1]	Yes	26	Buildings and Parking Lots **(Disqualified from CH)**	0.40
Netted Area (Demolition area containing administration building)[1]	Yes	27	Buildings and Walkways **(Disqualified from CH)**	1.70

Calculations	Line Numbers in Sum (Subtractions Indicated with 'minus')	Line #	Acres
Total acreage of demolition/site preparation area	20, 21, 22	28	3.52
Total acreage of vegetative clearing outside of refuge boundaries	16-19	29	1.19
Total acreage in CH within project footprint	2-7, 9, 11, 12, 14	30	11.27
Total acreage in CH to be cleared for Alt 1	2, 6, 7, 9, 11, 12, 14	31	10.75
Total acreage in CH to be cleared for Alt 2	2, 6, 7, 10-12, 14	32	7.75
Total footprint of project	1-9, 11-22	33	22.46
Total acreage of demolition area	20, 21	34	1.42
Net loss of critical habitat after site prep for Alt 1	31	35	10.75
Net loss of critical habitat after site prep for Alt 2	31	36	7.75
Total limestone karst forest in vegetative clearing	2, 7, 9, 12, 14, 18, 19	37	10.94
Total netted areas	-	38	7.12
Values for General Vegetation in Project Area			
Vegetated portion of focus area	9	39	6.93
Utilities along Hwy 3A	2,14, 16-19	40	3.97
Jeep Trail and Turnaround	11, 12	41	0.88
Culverts	6, 7	42	0.16
Total general vegetation in project area (inclusive of critical habitat)	39-42	43	11.94
Net loss of general vegetation after site preparation	43 minus 28	44	8.42

Notes: [1]Aerial imagery was used to identify current features such as buildings, roads, parking lots, and urban landscaped areas, which was used to disqualify such areas from Critical Habitat designation. Data was digitized using GIS software and the Esri World Imagery Basemap (dated 2022). Such acreage is accounted for in in-text references to Demolition Area Critical Habitat.

Vegetation data provided by the base (dated 2008) does not reflect current conditions in the Demolition Area. It is recommended to use the current condition acreages instead of the vegetation type acreages above.

CH = Critical Habitat

This page intentionally left blank.

E.2 ESA Section 7 Biological Assessment

This page intentionally left blank.

Final
BIOLOGICAL ASSESSMENT
FOR THE
RELOCATION AND RECONSTRUCTION OF STRUCTURES, FACILITIES AND ASSOCIATED INFRASTRUCTURE
AT THE
GUAM NATIONAL WILDLIFE REFUGE, RITIDIAN UNIT
DEDEDO, GUAM

July 2024

This page intentionally left blank.

Final
Biological Assessment
Relocation and Reconstruction of Structures, Facilities and Associated Infrastructure at the Guam National Wildlife Refuge, Ritidian Unit

Table of Contents

Abbreviations and Acronyms ..... **iii**
1 Executive Summary **1-1**
2 Proposed Action **2-1**
2.1 Introduction 2-1
2.2 Location 2-3
2.2.1 Construction of Replacement DOI Facilities and Associated Infrastructure 2-5
2.2.2 Alternate Access to Recreational Portions of the Refuge and Road Improvements 2-8
2.2.3 Demolition of Existing Facilities and Preparation of the Site for Restoration and Regeneration 2-9
2.2.4 Project Implementation 2-10
2.3 Conservation Measures 2-11
3 Status of the Species and Critical Habitat in the Action Area – Environmental Baseline 3-1
3.1 Threatened and Endangered Species within the Action Area 3-1
4 Effects of the Action and Cumulative Effects **4-1**
4.1 Approach to Analysis 4-1
4.1.1 Likely to Adversely Affect Determinations 4-1
4.1.2 Not Likely to Adversely Affect Determinations 4-5
5 Conclusion-Determination of Effect **5-1**
6 References and Personal Communication **1**

List of Figures

Figure 2-1 Overlay of SDZ Boundary and Existing DOI Facilities 2-2
Figure 2-2 Project Area - Ritidian Unit of the Guam National Wildlife Refuge 2-3
Figure 2-3 Proposed Action Location 2-4
Figure 2-4 Notional Construction Footprint 2-7
Figure 2-5 Conceptual Facility Layout within Construction Footprint 2-8
Figure 2-6 Proposed limits of Demolition Clearing and Grading 2-10

Figure 2-7 MCBCB Forest Enhancement Site, Salvage, Transplantation, and Translocation Projects 2-18
Figure 2-8 Proposed Netted Areas within the Guam National Wildlife Refuge 2-19
Figure 3-1 Previous Survey Data for Federally Listed and Host Plant Species 3-2
Figure 3-2 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022) 3-4
Figure 3-3 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022) 3-5
Figure 3-4 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022) 3-6
Figure 3-5 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022) 3-7
Figure 3-6 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022) 3-8

List of Tables

Table ES-1 Federally Listed Species within the Action Area 1-1
Table 3-1 Federally listed ESA-Listed Species Known to or with Potential to Occur within the Action Area 3-3
Table 3-2 Condition of Cycas micronesica within the ROI 3-17
Table 5-1 Determination of Effect for Federally Listed Species within the Action Area 5-1

Appendices

Appendix A *Memorandum of Agreement between the Department of the Interior and the Department of the Navy for Management of the Ritidian Unit of the Guam National Wildlife Refuge, The U.S. Geological Survey Brown Treesnake Research and Rapid Response Facilities, and Operation of Overlapping Surface Danger Zones*" May, 2020

Appendix B *Health Assessment Criteria Worksheet*

Appendix C *Cycad Conservation Framework*

Appendix D. *Guam National Wildlife Refuge (GNWR) Facilities Relocation: Minimizing Impacts to Critical Habitat*

Abbreviations and Acronyms

A.D.	Anno Domini
AAFB	Andersen Air Force Base
APE	Area of Potential Effects
B.C.	Before Christ
BLM	Bureau of Land Management
BTS	Brown Tree Snake
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNMI	Commonwealth of the Northern Mariana Islands
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
DNL	day-night average sound level
DoD	Department of Defense
DOI	Department of the Interior
DON	Department of the Navy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
GAR	Guam Administrative Rules
GHG	Greenhouse Gas
IT/COMM	Information Technology/ Communications
JRM	Joint Region Marianas
KOP	Key Observation Point
LFTRC	Live Fire Training Range Complex
LID	Low Impact Development
MCBCB	Marine Corps Base Camp Blaz
MOA	Memorandum of Agreement
MPMG	Multi-Purpose Machine Gun
MSL	mean sea level
NAVFAC	Naval Facilities Engineering Systems Command
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NGLA	Northern Guam Lens Aquifer
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PA	Programmatic Agreement
ROD	Record of Decision
ROI	region of influence
SDZ	Surface Danger Zone
SEIS	Supplemental Environmental Impact Statement
SWPPP	Stormwater Pollution Prevention Plan
U.S.	United States
UFC	Unified Facilities Criteria
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WWTP	Wastewater Treatment Plant

This page intentionally left blank.

1 Executive Summary

In accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq), this document serves to solicit formal consultation from the United States Fish and Wildlife Service (USFWS), Ecological Services for the proposed relocation and reconstruction of structures, facilities and associated infrastructure at the Guam National Wildlife Refuge – Ritidian Unit ("the Refuge") used by the USFWS Refuge Program and U.S. Geological Survey (USGS) Brown Treesnake Research and Rapid Response (BTS RRR) team, collectively referred to as the Department of the Interior (DOI) facilities. The relocation and reconstruction requires the demolition of existing facilities (e.g. DOI administrative and laboratory buildings, USFWS's nature exhibit, USFWS's maintenance building and associated parking areas) as well as the construction of new facilities (e.g. USFWS refuge headquarters and nature center, USGS headquarters and laboratory, a maintenance shop, a brown tree snake enclosure, a plant nursery, and parking). The relocation would require modifications and installation of associated infrastructure at the Refuge. The proposed action also includes road improvements and development of an alternate public access route from the newly constructed facilities to the recreational portions of the Refuge, transplantation of some federally threatened plant species from the construction areas to ungulate-free forest enhancement areas on Marine Corps Base Camp Blaz (MCBCB), and transplanting native plants throughout the Refuge.

Table ES.1 indicates the ESA-listed species and designated critical habitat that occur or may occur within the action area and the effects determination. The U.S. (US) Marine Corps has determined that implementation of the proposed action is likely to adversely affect (LAA) *Cycas micronesica*, *Dendrobium guamense,* Guam tree snails, Mariana fruit bats, *Tabernaemontana rotensis*, and critical habitat for the Mariana fruit bat, Guam kingfisher[1], and the Mariana crow and may affect but not likely to adversely affect (NLAA) green turtles, Mariana eight-spot butterfly, humped tree snails, fragile tree snails, and *Serianthes nelsonii*.

Table ES-1 Federally Listed Species within the Action Area

Scientific name/Critical Habitat	Common name (English/Chamorro)	ESA Status	Effects Determination
Cycas micronesica	Fadang	Threatened	LAA
Dendrobium guamense	No common name	Threatened	LAA
Partula radiolata	Guam tree snail/akaleha'	Endangered	LAA
Pteropus mariannus	Mariana fruit bat/fanihi	Threatened	LAA
Tabernaemontana rotensis	No common name	Threatened	LAA
Chelonia mydas	Green turtle/haggan (Central West Pacific distinct population segment)	Endangered	NLAA
Hypolimnas octocula marianensis	Mariana eight-spot butterfly/ababang	Endangered	NLAA

[1] Critical habitat was designated for the Guam Micronesian kingfisher in 2004; however, a taxonomic revision in 2023 (88 FR 7134) resulted in Guam kingfisher as the corrected species name and will be referred to throughout this document

Partula gibba	Humped tree snail/akaleha'	Endangered	NLAA
Samoana fragilis	Fragile tree snail/akaleha'	Endangered	NLAA
Serianthes nelsonii	Fire tree/Hayun lagu	Endangered	NLAA
Critical Habitat for the Mariana fruit bat, Guam kingfisher and the Mariana crow	N/A	Designated	LAA

2 Proposed Action

2.1 Introduction

The U.S. Marine Corps proposes to relocate and reconstruct existing USFWS refuge facilities and USGS research facilities on the Refuge by demolishing the existing facilities and constructing new facilities with associated infrastructure for the DOI within the Refuge. The Proposed Action is required based on the U.S. Department of the Navy's (DON) 2010 Guam and Commonwealth of the Northern Mariana Islands (CNMI) Military Relocation Record of Decision (ROD) and the DON's 2015 Supplemental Environmental Impact Statement and ROD. The 2015 ROD identified a site on Andersen Air Force Base (AAFB) for a new live fire training range complex (LFTRC), which includes a Multi-Purpose Machine Gun (MPMG) range. When the MPMG range is in use, the associated surface danger zone (SDZ) overlays a portion of the Refuge (including the current DOI facilities) (Figure 2-1). In accordance with Marine Corps Order 3570.2J, an SDZ is an area associated with a training range that is designed to protect people during weapons training. When activated, the SDZ is an exclusion area that is strictly controlled to protect public safety.

The 2015 National Defense Authorization Act (NDAA) (Public Law No. 113-291) authorized the establishment of the SDZ over a portion of the Refuge. Section 2822 of the 2015 NDAA authorized the DON and DOI to enter into an agreement authorizing the establishment and operation of an SDZ over the Refuge, and the relocation and reconstruction of impacted facilities within the Refuge. Pursuant to that authority, the DON and the DOI entered into a memorandum of agreement (MOA) "*Memorandum of Agreement between the Department of the Interior and the Department of the Navy for Management of the Ritidian Unit of the Guam National Wildlife Refuge, The U.S. Geological Survey Brown Treesnake Research and Rapid Response Facilities, and Operation of Overlapping Surface Danger Zones*", which was signed in May, 2020 (Appendix A). Section V.C.6 of the MOA requires the DON to "build [a] permanent replacement office, visitors' area, maintenance, research facilities, and any other facilities DON and DOI agree are commensurate with those impacted by the SDZs." Section V.C.6.c of the MOA further states: "In order to minimize adverse effects to designated critical habitat on the Refuge from construction of new permanent facilities, DON will demolish the existing DOI facilities, remove demolition debris, and prepare the site for restoration and regeneration." Section V.C.7 also requires the DON to identify and construct alternate access to the recreational portion of the Refuge outside the SDZ. To support its mission, the DOI requires the relocated facilities be built within the Refuge (MOA Section IV(J)(a)).

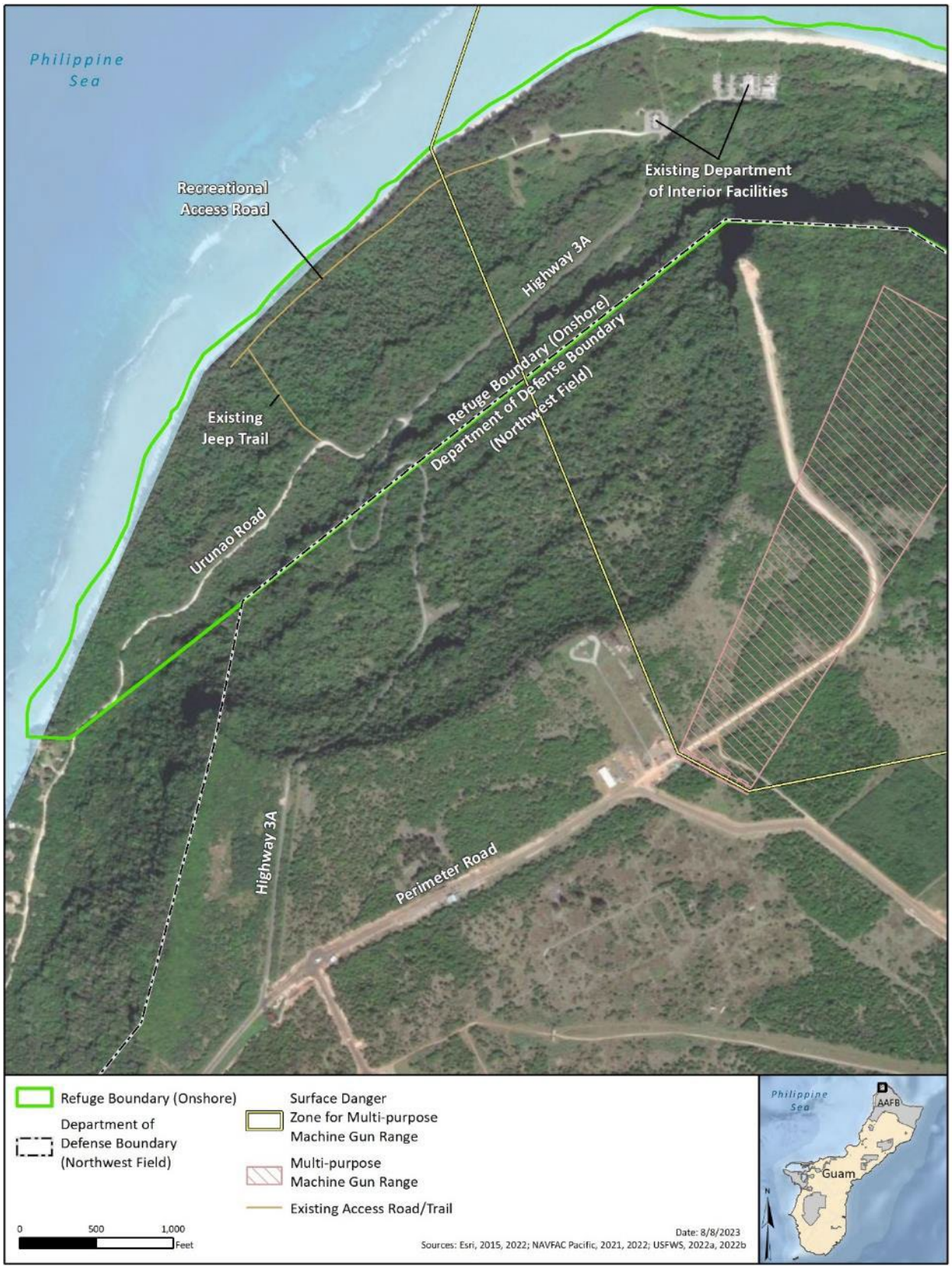


Figure 2-1 Overlay of SDZ Boundary and Existing DOI Facilities

2.2 Location

Figure 2-2 shows the project area for the Proposed Action within the Refuge, including the existing facilities to be demolished (northern yellow polygon) and the proposed footprint for new DOI facilities (southern yellow polygon). The proposed construction work is within the terrestrial portion of the Refuge. The project also includes associated construction, utilities and infrastructure to support the proposed new facilities that occur on both the Refuge as well as utility realignment on Andersen Air Force Base and the Forest Enhancement Areas on MCBCB. The project area also includes the entire Refuge where conservation measures to minimize the impact to critical habitat will be implemented. The total construction footprint is approximately 11.9 acres, of which 10.75 are considered critical habitat.

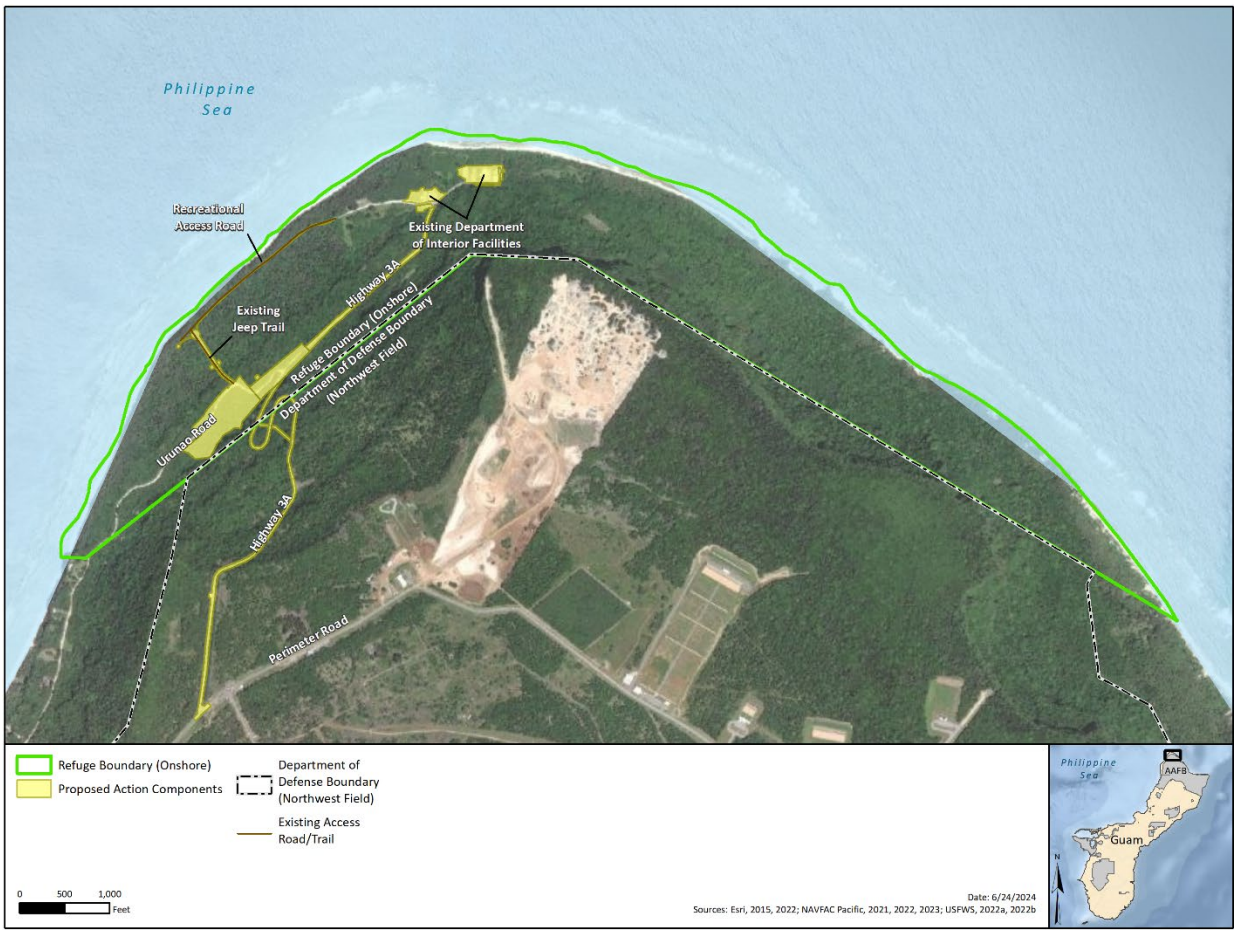


Figure 2-2 Project Area - Ritidian Unit of the Guam National Wildlife Refuge

Figure 2-3 depicts the location of the existing DOI facilities to be demolished including laydown areas (purple area), the focus area for the new construction of facilities (blue polygon), the associated construction laydown area (yellow and red hatch), utility realignment (red), as well as road improvements to the existing recreational access road and Jeep Trail (yellow).



Figure 2-3 Proposed Action Location

2.2.1 Construction of Replacement DOI Facilities and Associated Infrastructure

Required DOI facilities would include the construction projects and facility functions listed below:

Administration/Laboratories/Nature Center/Conference Room. These functions, with a combined space requirement of approximately 14,000 square feet, will be developed as separate facilities. The USGS Headquarters and Laboratory facility would include office and administrative spaces for onsite USGS staff and laboratory areas to support ongoing research related to the BTS and other species. The USFWS Headquarters and Nature Center would include administrative, classroom, storage, and research laboratory space for onsite USFWS staff and areas for public outreach and education. The nature center would include educational displays, a covered outdoor learning area, a multi-purpose classroom, nature exhibit, and public restrooms. A shared conference/classroom facility would provide meeting and training space for both USFWS and USGS staff.

Maintenance Shop. This approximately 5,000 square foot facility would provide storage and maintenance space for DOI equipment, vehicles, and other items. The shop would include four vehicle maintenance bays (one with a vehicle lift), storage areas, administrative office space, and a restroom with shower. Associated infrastructure would include an outside vehicle wash station and paved outdoor storage space for two shipping containers. Storage for corrosive and flammable materials would also be provided, either as a separate structure of approximately 150 square feet or combined with the maintenance shop.

Brown Tree Snake Enclosure. An approximately 4,300 square feet octagon shaped, open-air BTS research enclosure with 4.5 foot high smooth concrete walls, similar to the existing BTS enclosure, would be constructed.

Plant Nursery. A plant nursery totaling approximately 720 square feet would provide a shaded outdoor shelter for ESA-listed species plant propagation. It would consist of a concrete slab with a 3.5-foot-high perimeter wall and shade cloth spanning concrete columns and beams, as well as an adjacent workroom.

Parking. Requirements for paved parking include approximately 32 staff parking spaces, 30 visitor spaces, space for tour buses, and an additional unimproved parking area with room for approximately 100 vehicles for overflow parking.

Ancillary infrastructure within the new facility area would include courtyards, sidewalks, driveways, and internal roads; boundary fencing and gates; rock fall protection (as needed); separate enclosures for generators, fuel tanks, electrical and mechanical utility equipment, waste containers, etc.; and stormwater catchment/infiltration basins and other low impact development (LID) measures. Site preparation prior to construction would include vegetation clearing, grading, and temporary erosion control.

Utility infrastructure would include electrical, water (potable, irrigation, and fire protection), wastewater, and information technology/communications systems. Mechanical utility infrastructure would include a water pump, storage tank and distribution network for fire

response, potable water storage tank and distribution system, rainwater catchment tank, fuel storage tank, underground septic tank and leach field, oil/water separator, and stormwater drainage systems. Outside area lighting at the new facility site would be fully shielded to avoid impacts to sensitive species, meeting Unified Facilities Criteria (UFC) 3-530-01 ratings to reduce illumination of sensitive habitats within the Refuge. All drainage systems would be consistent with relevant stormwater pollution prevention plans (SWPPPs) and requirements.

All buildings would be constructed with reinforced concrete and all components such as exterior walls, flooring, foundations, windows, roofing, and utility systems would be designed to comply with Guam's seismic and environmental conditions, applicable UFCs, and USFWS space management requirements. The architectural design would be consistent with local and indigenous cultural influences and the unique climate characteristics of Guam, including roof overhangs that shade exterior walls and openings, light-colored walls that reflect solar radiation, and covered building entrances that provide shelter from the elements. Facilities would also comply with all applicable permits, DOI and USFWS criteria for facility security and cybersecurity, and any other applicable design and construction standards.

The new facilities and infrastructure would encompass up to an estimated 7.5 acres (as compared to the existing DOI facility complex of approximately 1.4 acres).

Figure 2-4 shows the notional construction footprint for the new facilities (7.5 acres). Figure 2-5 shows a conceptual layout of the proposed DOI replacement facilities. This notional layout demonstrates one concept for how the new facilities and infrastructure could potentially be arranged within the construction footprint, while providing flexibility in design and construction. Following construction, the Marine Corps would transfer the new facilities to the DOI, who would operate the facilities, continue to manage the Refuge and BTS RRR program, and be solely responsible for maintenance, per commitments outlined in Appendix A.

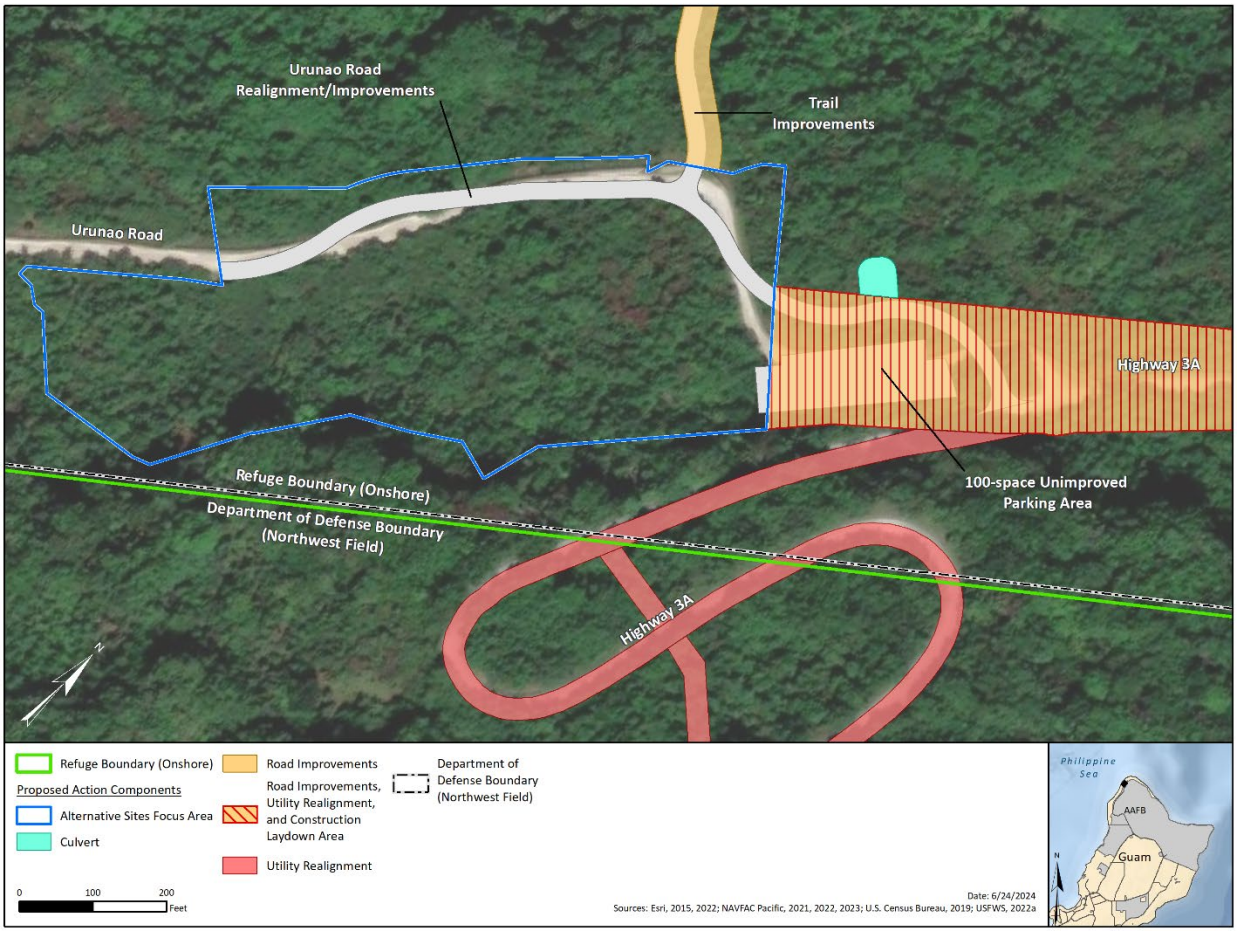


Figure 2-4 Notional Construction Footprint



Figure 2-5 Conceptual Facility Layout within Construction Footprint

2.2.2 Alternate Access to Recreational Portions of the Refuge and Road Improvements

In the 2020 MOA, the both parties agreed that DOI would "provide public access to beaches, trails, and cultural properties during normal business hours consistent with the [Comprehensive Conservation Plan] and when the LFTRC is not being used…" and that DON would "endeavor to provide the maximum practicable access" to the Refuge, "consistent with the accomplishment of training requirements…" (see Appendix A, sections V.B.7 and V.C.4).

To provide public access between the new DOI replacement facilities and the recreational portions of the Refuge, the Marine Corps would identify and provide an alternate access route, which would include improvements to existing roads and vehicle trails where needed.

These road improvements would include the following (Figure 2-3):

> 1, Highway 3A: Portions of this paved roadway or its unpaved shoulders would be excavated/repaved as needed to install underground utilities to connect the replacement facility site to existing utility networks outside the Refuge. The intersection of Highway 3A with Urunao Road would be reconfigured slightly and appropriate traffic control

measures added. A new steel barrier gate would be installed on Highway 3A just past the intersection with Urunao Road to prevent vehicles from traveling further on Highway 3A when the MPMG range is active and the SDZ is closed to public access.

2. Urunao Road: A portion of this existing unimproved road would be realigned and paved to accommodate the proposed replacement facilities. Improvements to Urunao Road would be designed to accommodate two-way traffic on an asphalt surface, beginning at the intersection with Highway 3A and ending at the furthest vehicle access driveway into the replacement DOI facility campus. Beyond the DOI access point, the road would remain in its current unimproved state. Underground utility lines would be installed beneath the realigned/improved road to supply the DOI facilities. A new unimproved visitor parking area with spaces for approximately 100 vehicles would be cleared between the realigned Urunao Road and Highway 3A.

3. Jeep Trail: Fencing and a gate would be installed at the intersection of the improved Jeep Trail Road (not currently used for vehicles) with Urunao Road to prevent public access to the Refuge when it is closed. At the beach end of the improved Jeep Trail Road, a paved turnaround would be constructed at the intersection with the Recreational Access Road. The improved Jeep Trail Road would also include a parallel concrete path to provide safe pedestrian access from the new facility campus to the Recreational Access Road, and the new turnaround would include areas for pick-up and drop-off of pedestrians, and an accessible parking space. The Jeep Trail Road would be constructed using concrete and asphalt pavements. Concrete pavement with special cured finishes would be added to provide slip-resistant traction for vehicles traversing the steepest slopes of the roadway, while the remainder would be asphalt, including the turnaround. Retaining walls would be constructed as determined necessary during project design. The paved road and turnaround would be designed to support fire and other emergency vehicle access.

4. Recreational Access Road: No excavation, widening, or paving would occur along this road, and improvements would be limited to filling any potholes to provide a level surface. A new steel barrier gate would be installed where this road crosses the SDZ to prevent access when the SDZ is active.

2.2.3 Demolition of Existing Facilities and Preparation of the Site for Restoration and Regeneration

In addition to DOI facility construction and the above road improvements, the project would also include demolition of the existing DOI facilities.

Following the completion of new construction and the relocation of DOI functions to the new replacement facilities, a site investigation would be conducted prior to demolition activities to determine if any hazardous materials are present in the existing buildings or in the surrounding soil that may require special handling. The Marine Corps would demolish the existing DOI administrative, nature center, mechanics shop, landscaped areas, paved parking areas adjacent to

the existing facilities and other DOI facilities under the SDZ in accordance with appropriate handling requirements. The removal of demolition debris would include establishing temporary stockpiles and staging areas for processing of debris for potential reclamation of recyclable materials (such as scrap metal) and milling of excess rock, concrete, and asphalt (Figure 2-6). Existing roads and unimproved parking areas would remain in place to be used when the MPMG range is not in use. Utility lines would be abandoned in place; the existing BTS enclosure would remain in place.

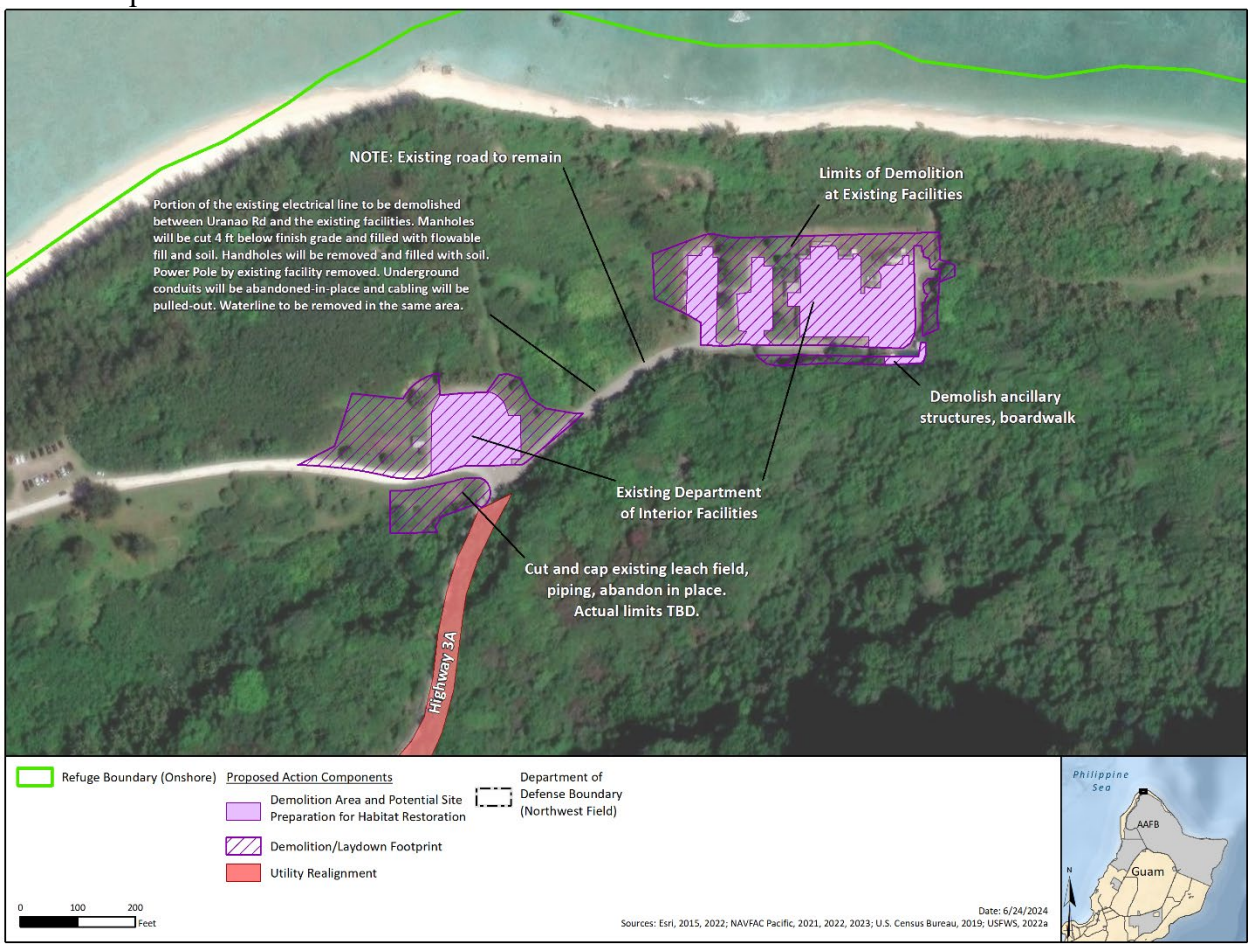


Figure 2-6 Proposed limits of Demolition Clearing and Grading

Post-demolition preparation of the site would include clearing, grading and placement of topsoil in the potential habitat area. Following the Marine Corps' post-demolition preparation, the DOI would continue to manage the Refuge and would be solely responsible for the ongoing care and maintenance of the site.

2.2.4 Project Implementation

The Proposed Action would be implemented in a phased manner intended to limit potential disruptions to USFWS and USGS missions and functions within the Refuge.

- Phase 1 would include construction of the new facilities, associated infrastructure, and road improvements.
- Phase 2 would relocate USFWS and USGS to the new facilities, which is estimated to require approximately 6 months plus a 30-day activation period.

- Phase 3 would include the demolition of existing DOI facilities and preparation of the site for restoration and regeneration of vegetation.

Construction of the proposed replacement facilities and associated infrastructure (including road improvements) would be completed and DOI staff and equipment would be transitioned to the new facilities before demolition at the current DOI facility site (Phase 3) would begin. The three phases are projected to require approximately 36 months to complete, beginning in mid-2026 and concluding in mid-2029.

2.3 Conservation Measures

The project's conservation measures are designed to avoid or minimize project effects to listed species and critical habitat or to contribute to the recovery of a listed species. The conservation measures listed below have been reviewed by the Refuge and represent cooperative development between the Refuge and DON. Conservation measures are considered an integral part of the proposed action and are vital to determining the scope of the proposed action. Implementation of conservation measures is required under the terms of the proposed action. After the conservation measures have been implemented, the long-term management of the species addressed in this consultation are the responsibility of the landowner (MCBCB or Refuge) and will be conducted in accordance with the appropriate plan (Joint Region Marianas Integrated Natural Resources Management Plan (INRMP) or the Guam National Wildlife Refuge *Comprehensive Conservation Plan* (CCP)). The INRMP and CCP provide long-term guidance for management decisions and sets forth goals, objectives and strategies needed to accomplish management purposes.

Conservation Measures for all Species and Critical Habitat Addressed in the Biological Assessment

1. DON will ensure that all activities will occur as described in the proposed action.
2. DON will minimize impacts to listed species and critical habitat by consolidating functions to the maximum extent practicable in design planning and development, while meeting the needs of the Refuge and USGS.
3. All construction personnel working at the project site will be provided with information about the listed species that may occur in the work areas and will be required to attend a natural resources training program focused on federally listed species conducted by a qualified biologist.
4. Any plant material collected on the Refuge, for the purposes of propagation, outside of the construction footprint for must be coordinated with and approved by Refuge.
5. DON will ensure a qualified biologist will survey the construction and demolition project footprints and a 10 meter buffer prior to the start of construction or demolition activities to map the locations of all threatened and endangered species including home/host plant locations. The purpose of the survey is to get an accurate count of the number of salvageable threatened or endangered species and to allow for collection of the threatened or endangered species for transplant (plants) or translocation (animals).
6. A qualified biologist is defined as a person who:
    - has successfully completed a full four-year course of study in an accredited college or university leading to a bachelor's or higher degree, which includes a

major field (24 semester hours) of study in biological sciences, wildlife biology, botany, natural resources management, environmental sciences, or related disciplines appropriate to this position; and

- a minimum of 20 documented hours of field identification (positive results) of the threatened and endangered species or closely related species.

OR

- has a minimum of 24 semester hours (or equivalent quarter hours) in biological sciences, wildlife biology, botany, natural resources management, environmental sciences, or related disciplines appropriate to this position at an accredited college or university;
- one year (2000 hours) of field biology survey experience in the Pacific Islands; and
- a minimum of 20 documented hours of field identification (positive results) of the threatened and endangered species or closely related species.

Three references to validate experience is required prior to conducting any surveys or conservation measures.

Species Specific Conservation Measures

***Cycas micronesica (LAA)*:**

To avoid or minimize impacts to *Cycas micronesica*, DON will undertake the following:

1. There is some uncertainty regarding the final project footprint and the number of *C. micronesica* that will be permanently removed as a result of the action. As of 2024, there were 69 *C. micronesica* considered to be in "good" and "fair" condition, 26 were considered in "poor or dead" condition and 16 plants were not evaluated for their condition within the project footprint. As the construction designs are finalized, the number of salvageable *C. micronesica* will be determined by the qualified biologist. This "x" number will be used to determine the number of plants needed to offset the impacts of the action.

    - If a *C. micronesica* plant is located within a project footprint during pre-construction surveys, the plant will be evaluated to determine if the plant or parts were of the plant are healthy and suitable for salvage and transplantation. A plant must be considered "salvageable" to be suitable for salvage and transplantation. A qualified biologist will make the determination of the plant health using the Health Assessment Criteria Worksheet (Appendix B).
    - Salvage of plant material for cycads would be dependent on salvage work method feasibility (e.g., safety and site specific conditions) and sufficient plant health to support transplantation survival.
    - Whole plants will only be transplanted once they have been determined to be healthy and suitable for transplant within the fenced, ungulate-free forest enhancement areas on MCBCB (Figure 2-7).
    - The DON may collect seed or cuttings from healthy plants that will be cleared or impacted as part of the construction activities in order to propagate in a nursery and transplant within the forest enhancement areas on MCBCB.

- Seeds and cuttings may be collected from individuals outside the project footprint, but within the Refuge; however, no more than ten percent of any individual plant's seeds.
- During transplant, to the maximum extent possible, propagated plants from the same genetically unique individual (i.e., a stem and pup from the same parent tree) will be planted the maximum distance apart allowed by the planting arrangement.
- After transplanting the *Cycas micronesica* will be subject to an annual treatment with a slow-release imidacloprid insecticide to treat cycad *Aulacaspis* scale for a duration of five years.

2. Identification tags will accompany transplanted *C. micronesica* as well as GPS submeter coordinates for the *C. micronesica* locations during the 20 year monitoring period (refer to # 2 below).

3. After transplanting, 12 months of maintenance will be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species will be removed within a 20-foot (6-meter) radius around transplants.

4. Monitoring will continue until the transplants meet the survival criteria (#5 below). Maintenance will be reduced and eliminated during a hardening-off period and then the plants will be monitored for at least 6 months following cessation of maintenance activities. Following completion of the survival criteria monitoring period, intermittent monitoring will occur at 5, 10, 15, 19, and 20 years following transplanting.

5. Transplanted *C. micronesica* will be considered living/surviving when they show: full crown development, no visible sign of nutrient deficiencies, and no visible sign of stem rot/decay. Photographs will be taken annually to document full crown development, lack of nutrient deficiencies and no visible signs of stem rot/decay. In order to maintain the number of cycads that would be expected to occur 20 years from the start of vegetation clearing, the project will salvage or propagate a sufficient number of cycads based on a 5.8% annual rate of decline (Appendix C).

Dendrobium guamense (LAA):

To avoid or minimize impacts to *Dendrobium guamense*, DON will undertake the following:

1. There is some uncertainty regarding the final project footprint and whether or not the one *D. guamense* within the area proposed for utility realignment will be permanently removed as a result of the action.
    - If a *D. guamense* plant is located within a project footprint during pre-construction surveys, the plant will be evaluated to determine if the plant is healthy and suitable for salvage and transplantation. A plant must be in good or fair condition to be suitable for salvage and transplantation. A qualified biologist will make the determination of the plant health.
    - Salvage of plant material for *D. guamense* would be dependent on salvage work method feasibility (e.g., safety and site specific conditions) and sufficient plant health to support transplantation survival.

- If the whole plant cannot be salvaged DON may collect seeds from healthy plants in the project footprint or within the MCBCB forest enhancement areas to propagate and transplant within the forest enhancement areas on MCBCB. The forest enhancement areas are fenced and have had ungulates removed. Any such seed collection or cuttings outside the project footprint would entail collection of no more than ten percent of any individual plant's seeds.
- Identification tags will accompany transplanted *D. guamense* as well as GPS submeter coordinates for the *D. guamense* locations.
- After transplanting, up to 12 months of maintenance will be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species will be removed within a 20-foot (6-meter) radius around transplants.
- Monitoring will continue until the transplants meet the establishment criteria described below. Maintenance will be reduced and eliminated during a hardening-off period and then the plants will be monitored for at least 6 months following cessation of maintenance activities.
- Plants will be monitored until they are considered established.
- Transplanted *D. guamense* will be considered established when they flower and set seed and there are no visible signs of nutrient deficiencies.
- Following completion of the establishment period, intermittent monitoring will occur at 5 and 10 years following transplanting.

Guam tree snails (LAA):

To avoid or minimize impacts to Guam tree snails, the DON will undertake the following:

1. A qualified biologist will coordinate with the construction crews to ensure any observed Guam tree snails are avoided or are translocated prior to work commencing.
2. A qualified biologist will inspect vegetation to be removed to confirm the plant does not contain a Guam tree snail. If a snail is found the area, the snail(s) will be collected by a qualified biologist with experience handling tree snails and translocated to a suitable site on the Refuge. The DON will coordinate with the Refuge in advance to identify potential snail translocation site(s).
    a. DON will conduct surveys of potential translocation sites. Tree snails may be relocated to more than one site after considering the total number of tree snails to be translocated, potential for human disturbance, flatworm presence, home tree abundance, and general canopy cover.

Tabernaemontana rotensis (LAA):

To avoid or minimize impacts to *Tabernaemontana rotensis*, DON will undertake the following:

1. There is some uncertainty regarding the final project footprint and whether or not the two populations (23 individuals) of *T. rotensis* within the utility realignment along Highway 3A will be permanently removed as a result of the action. No direct impacts to *T. rotensis* are anticipated. If a *T. rotensis* is located within a project footprint during pre-construction surveys, the plant will be evaluated to determine if the plant or parts of the plant are healthy and suitable for salvage and transplantation. A qualified biologist will make the determination of the plant health.

- Salvage of plant material for *T. rotensis* would be dependent on salvage work method feasibility (e.g., safety and site specific conditions) and sufficient plant health to support transplantation survival.
- The preferred method of plant propagation is seed collection and cuttings. Seeds and cuttings collected for this propagation activity would come from wild plants growing within the construction footprint (if available); any such seed and cutting collection outside the construction footprint would entail collection of no more than ten percent of any individual plant's seeds or plant parts.
- The number of plants that are replaced will be equal to or greater than the number that are directly impacted. The transplant location is dependent on the location of the plant. If the impacted plant is on DoD property, it will be transplanted on MCBCB. If the impacted plant is on the Refuge, it will be transplanted on the Refuge. Transplants will be planted either within the forest enhancement areas on MCBCB (approximately 19 plants) or the Refuge (approximately four plants).
- Identification tags will accompany transplanted *T. rotensis* as well as GPS submeter coordinates for the *T. rotensis* locations.
- After transplanting, up to 12 months of maintenance will be conducted. Maintenance may include watering, fertilizing, pesticide treatment, use of support structures, or invasive species removal. Invasive species will be removed within a 20-foot (6-meter) radius around transplants.
- Monitoring will continue until the transplants meet the establishment criteria described below. Maintenance will be reduced and eliminated during a hardening-off period and then the plants will be monitored for at least 6 months following cessation of maintenance activities.
- Plants will be monitored until they are considered established.
- Transplanted *T. rotensis* will be considered established when they show full crown development and show no visible sign of nutrient deficiencies. Photographs will be taken annually to document full crown development, reproductive structures, and lack of nutrient deficiencies.
- Following completion of the establishment period, intermittent monitoring will occur at 5 and 10 years following transplanting.

Green turtles (NLAA):

To avoid or minimize impacts to Green turtles, DON will undertake the following:

1. All outside area lighting would be fully shielded to avoid impacts to sensitive species, meeting UFC 3-530-01 ratings to reduce illumination of sensitive habitats within the Refuge. The colors of lights used would be limited to wavelengths in the yellow, orange, and red spectrum.
2. To avoid increased water on beaches, there will be no new or existing increases of any concentrated flow. Permanent stormwater design features for this project will be designed per the 2006 CNMI and Guam Stormwater Manual. The National Pollutant Discharge Elimination System (NPDES) Program Comprehensive Construction Storm Water Pollution Prevention Plan (Comprehensive SWPPP) for the Guam Military

Relocation DPRI Construction Program dated Nov 2014 is a guidance document intended to aid construction contractors as they prepare the project specific SWPPP.

Mariana fruit bats (LAA):

To avoid or minimize impacts to Mariana fruit bats, DON will undertake the following:

1. Construction contractors will be trained by a qualified biologist to identify Mariana fruit bats and conduct visual observations of the project footprint at the start of each day. If Mariana fruit bats are observed prior to the start of work within 100 meters, work will be postponed until the Mariana fruit bat has left the area of its own volition. If bat(s) enter the project footprint after the start of work, work will continue.
2. All outside area lighting would be fully shielded to avoid impacts to sensitive species, meeting UFC 3-530-01 ratings to reduce illumination of sensitive habitats within the Refuge. The colors of lights used would be limited to wavelengths in the yellow, orange, and red spectrum.

Conservation Measures for Critical Habitat for the Mariana fruit bat, Mariana crow and Guam kingfisher (LAA)

The approach for minimizing impacts to critical habitat is multifaceted to account for a variety of factors. Overall, the aim is to increase function and conservation of critical habitat to support the recovery of the Mariana fruit bat, Mariana crow and Guam kingfisher in the long term. Targeted plant species that provide foraging, nesting, roosting and rearing functions for the three species will be outplanted by the Refuge across the entire Refuge. The Refuges restoration and enhancement activities will consider geographic requirements for species (remoteness as described in the critical habitat), spatial variability in existing critical habitat quality, ungulate impacts, restrictions because of established surface danger zones and management ability. To minimize impacts to critical habitat for the Mariana fruit bat, Mariana crow and Guam kingfisher, the following will be conducted:

1. DON will demolish the existing DOI facilities, remove demolition debris, and prepare the site for potential restoration and regeneration. The demolition of the existing DOI facilities will leave approximately 1.4 acres of cleared area for habitat restoration and regeneration .

2. The DON will fund the Refuge to undertake the collection and outplanting of identified and prioritized plant species used for foraging, rearing, roosting, sheltering and nesting by the Mariana fruit bat, Mariana crow and Guam kingfisher to several focal areas (including the demolition site, if suitable after demolition) and across the Refuge where appropriate. This measure would minimize the construction impacts on critical habitat by providing protection from ungulates and enhancement of critical habitat in areas already demonstrating the appropriate substrate and microclimate to support outplantings.

3. DON will fund the Refuge to collect plant material, propagate, outplant and maintain these specific plant species for the benefit of the Mariana fruit bat, Mariana crow, and Guam kingfisher in areas selected by the Refuge.

4. The Refuge would target the outplanting and maintaining of sufficient plants to ensure that 488 genetically unique individuals of 15 different identified and prioritized native species would achieve fruiting twice (Figure 2-8). This conservation measure is further detailed in Appendix D.

5. Currently, ungulates are not controlled on any part of Refuge and continue to degrade habitat. Five areas will be netted to exclude ungulates for conservation benefit (Figure 2-8). The management actions within the netted areas would vary based on current habitat quality, substrate and access.

- Eastern side of the Refuge - 3.44 acres
- Eastern side of the Refuge – 1.26 acres
- South of proposed new facilities – 0.32 acres
- Demolition area (current nature center and parking lot) - 0.4 acres
- Demolition area (current administration building) - 1.7 acres

6. This conservation measure is a "turnkey" measure such that once DON has completed demolition site preparation and provided the agreed-upon funding for the measure, habitat management will be the responsibility of the Refuge. This means the Refuge will be responsible for implementation, compliance, and success of conservation measures associated with critical habitat as part of its on-going conservation management of the Refuge. All monitoring reports for this conservation measure will be prepared by the Refuge and provided to DON for submission to the USFWS in accordance with the biological opinion.

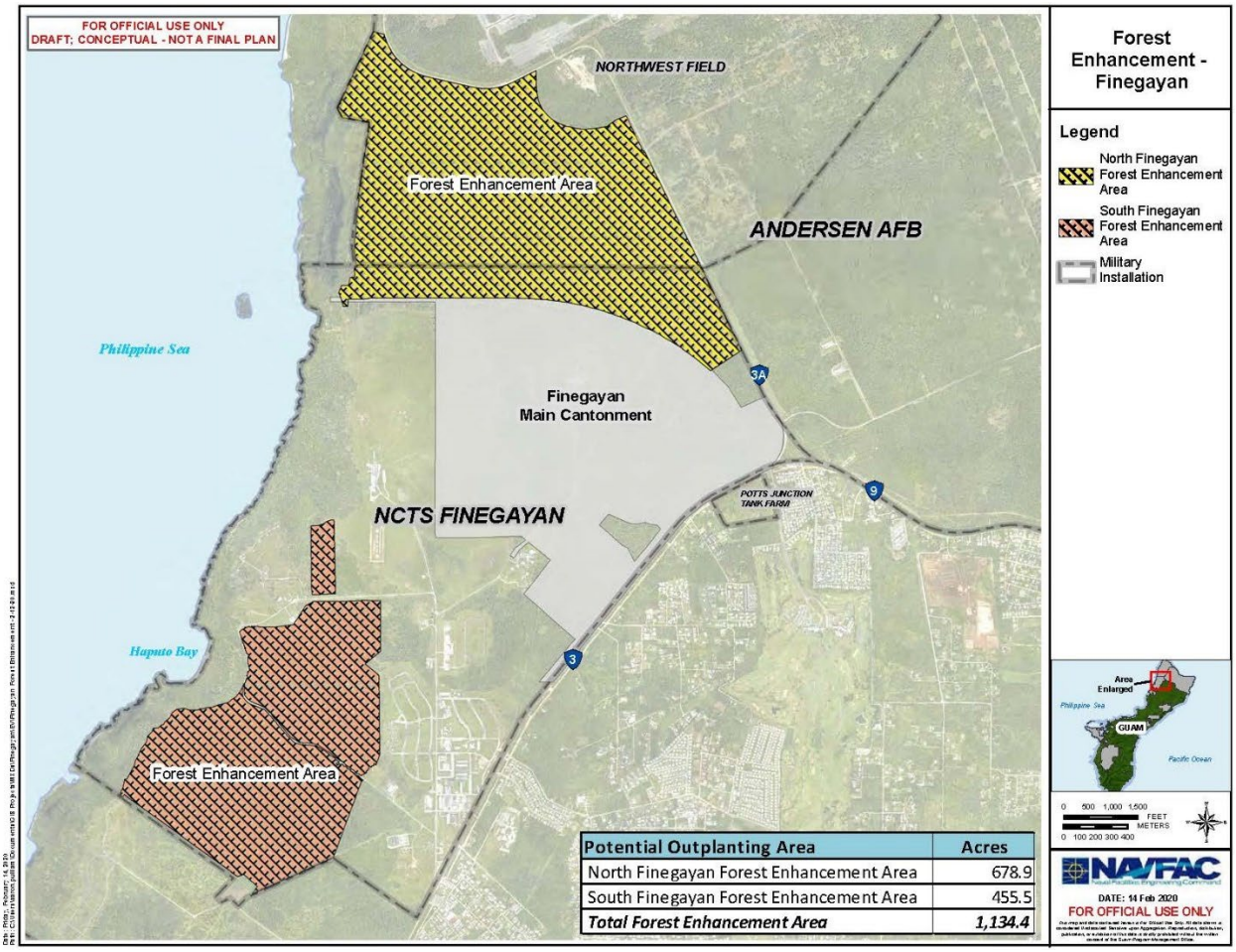


Figure 2-7 MCBCB Forest Enhancement Site, Salvage, Transplantation, and Translocation Projects



Figure 2-8 Proposed Netted Areas within the Guam National Wildlife Refuge

This page intentionally left blank.

3 Status of the Species and Critical Habitat in the Action Area – Environmental Baseline

Typhoons are a common meteorological occurrence on Guam and can occur year-round. In the 50 years between 1970 and 2019, Guam experienced a total of 49 typhoons, 12 of which were considered major (King et al. 2020). Although Typhoon Mawar passed over Guam in May 2023, reaching Category 4-level winds and causing considerable damage within and around the Refuge, the description of the status of the species and critical habitat is based on pre-typhoon conditions.

3.1 Threatened and Endangered Species within the Action Area

In December of 2021, a terrestrial biological survey was conducted documenting all ESA-listed plant and wildlife species occurring in the region of influence (ROI) (Scheuerman and Camacho 2022). The ROI for the 2021 surveys is a 52-acre area that includes the components of the proposed action (replacement facilities, road improvements, and removal of existing DOI facilities) and any areas that may experience noise, runoff, or other physical, direct or indirect impacts to flora and fauna or their habitat.

The 2021 survey utilized previous data from surveys (Figure 3-1) at or near the Refuge including: the Basewide Vegetation Survey, Mapping, and Report of Andersen AFB (AAFB 2008), Final Joint Region Marianas Integrated Natural Resources Management Plan (JRM 2013), Final Report: Biological Surveys – Reports 1&2, Various Locations on Guam in Support of the Guam and Commonwealth of the Northern Mariana Islands Military Relocation (2012 Roadmap Adjustments) Supplemental Environmental Impact Statement (NAVFAC Pacific, 2013), the final work plan for P-745 Surveys of Federally Listed Species at Guam National Wildlife Refuge (NAVFAC Pacific 2021), Guam Vegetation Mapping (United States Forest Service, 2006), Final Project Report - Federal Candidate Species Surveys on Guam (NAVFAC Marianas, 2014) and the GIS Data for Species Proposed for Listing on Guam (USFWS 2014a).

In 2024, additional surveys of the waterline and 6-acres of the replacement facilities area were conducted. The waterline was not included in the 52-acre ROI. The additional surveys of the 6-acres of the replacement facilities area were part of the biological monitoring in support of the geotechnical borings and topographic mapping.

The 2021 and 2024 survey information (Figure 3-2 through 3-6) and the previous survey data provided by the Refuge was used to create the list of federally listed ESA species know or with the potential to occur within the project footprint (Table 3-1).



Figure 3-1 *Previous Survey Data for Federally Listed and Host Plant Species*

Table 3-1 Federally listed ESA-Listed Species Known to or with Potential to Occur within the Action Area

Scientific Name	*Common Name*	*Chamorro Name*	*Federal ESA Status*	*Potential to Occur in ROI*
Mammals				
Pteropus mariannus	Mariana fruit bat (Mariana flying fox)	Fanihi	Threatened	Known to Occur[1,2]
Invertebrates				
Hypolimnas octocula marianensis	Mariana eight-spot butterfly	Abbabang	Endangered	Moderate[2]
Partula gibba	Humped tree snail	Akaleha	Endangered	Moderate[2]
Partula radiolata	Guam tree snail	Akaleha	Endangered	Known to Occur[1,2]
Samoana fragilis	Fragile tree snail	Akaleha	Endangered	Moderate[2]
Reptiles				
Chelonia mydas	Green turtle	Haggan	Endangered	Known to Occur[2]
Plants				
Cycas micronesica	Cycad/Federico nut	Fadang	Threatened	Known to Occur[1,2]
Dendrobium guamense	No common name	No Chamorro name	Threatened	Known to Occur[1]
Serianthes nelsonii	Fire tree	Hayun lagu	Endangered	Known to Occur[1]
Tabernaemontana rotensis	No common name	No Chamorro name	Threatened	Known to Occur[1,2]

Notes: [1]Species observed or indicator of presence (sign) during the 2021 biological surveys conducted for this EA (Scheuerman and Camacho 2022).
[2]Species observed in previous biological surveys (DON 2015).
Known to occur = Suitable habitat, and documented in the ROI.
Moderate = Suitable habitat, documented in the vicinity of the ROI

Sources: DON 2015; Government of Guam 2009; Guam Division of Aquatic and Wildlife Resources 2006; Scheuerman and Camacho 2022; USFWS 2022.



Figure 3-2 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022)

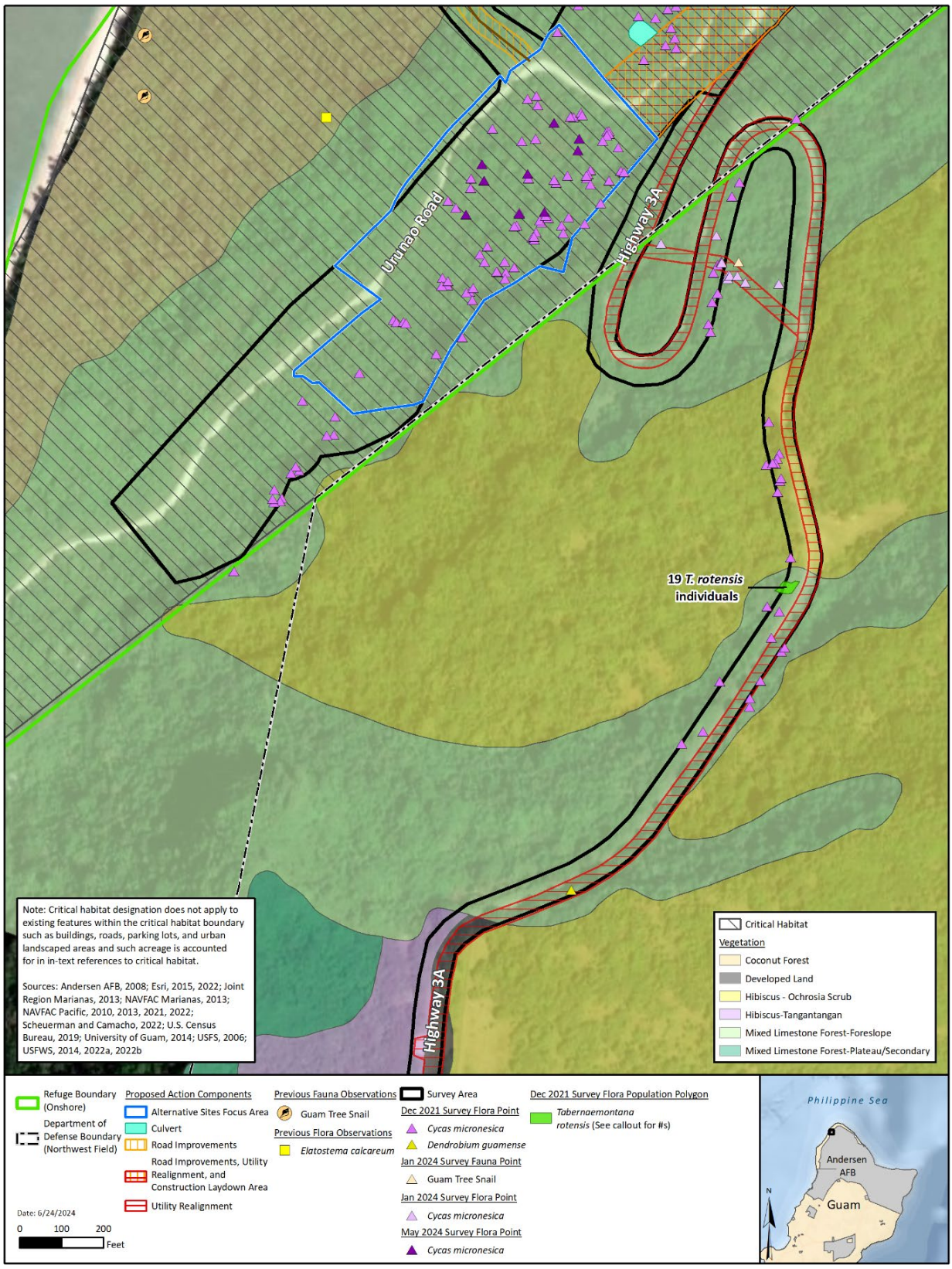


Figure 3-3 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022)

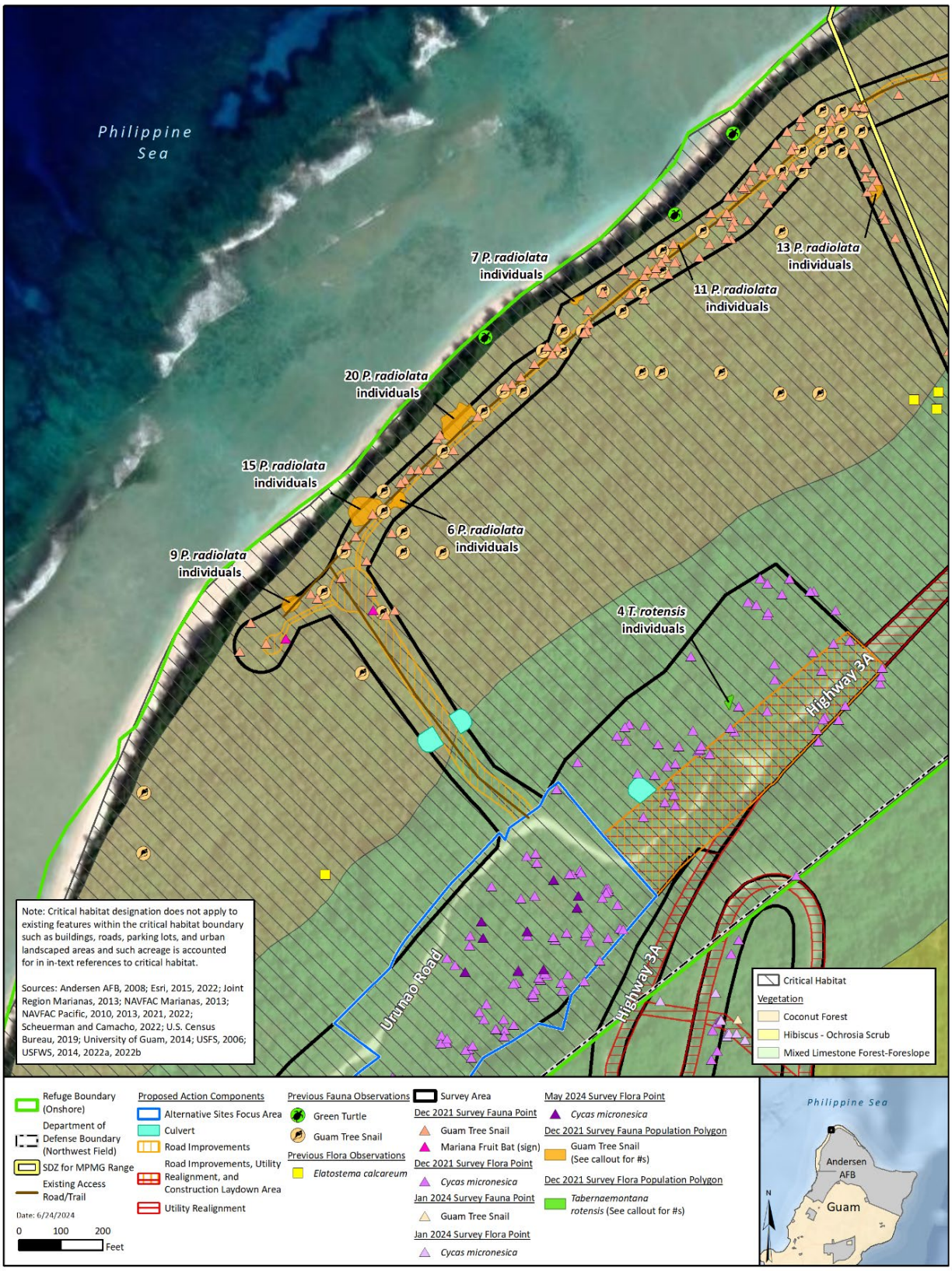


Figure 3-4 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022)

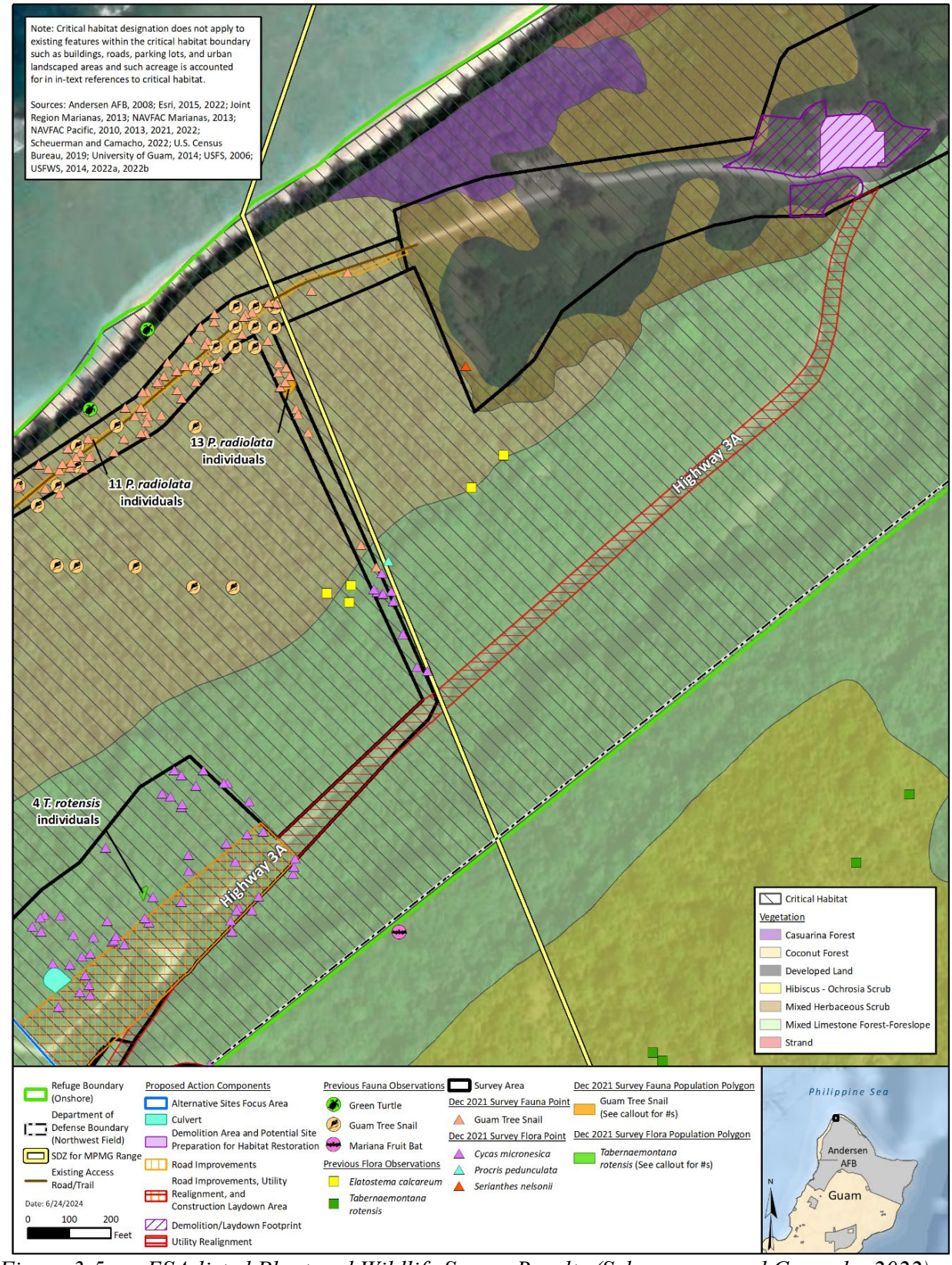


Figure 3-5 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022)

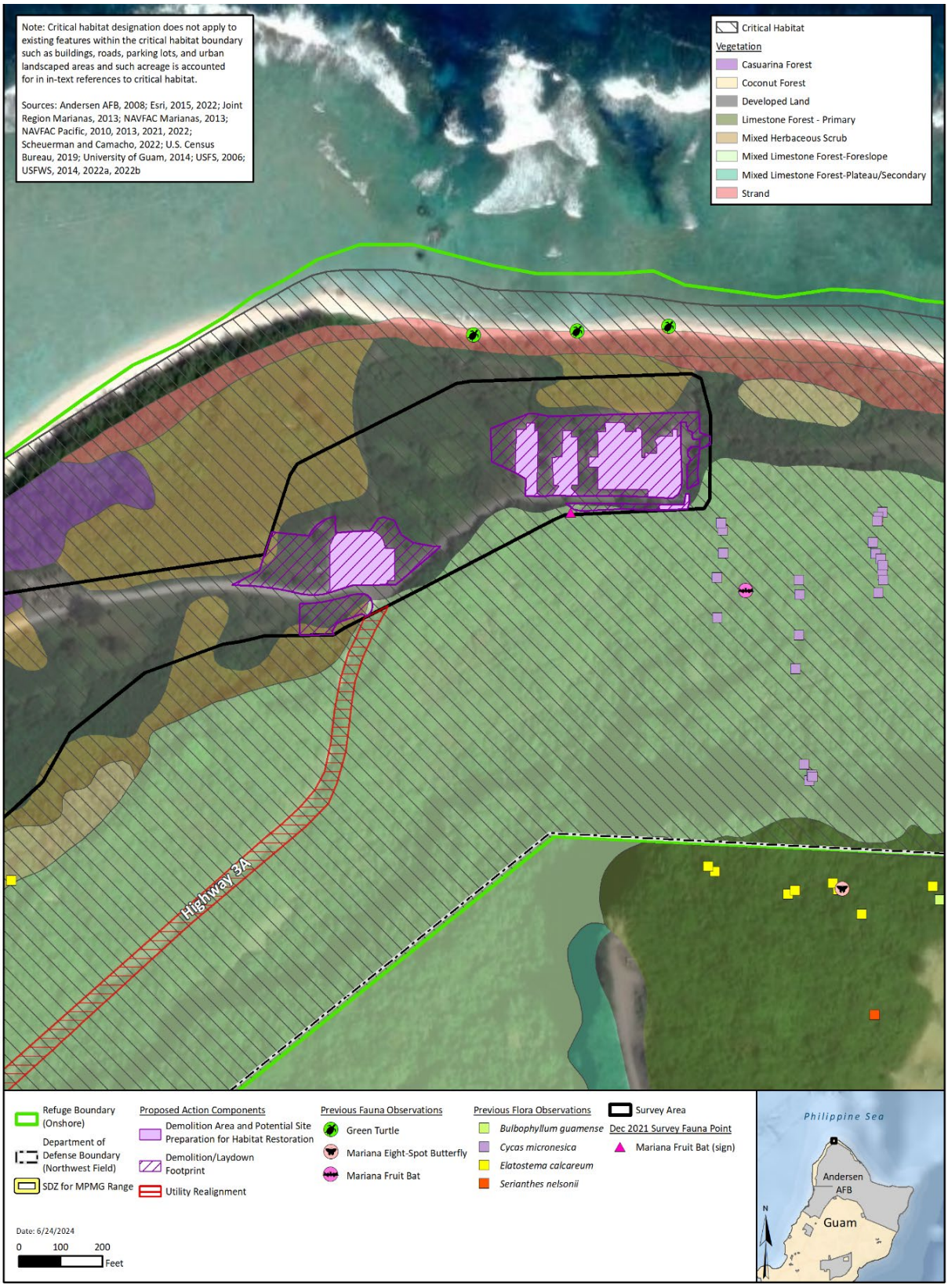


Figure 3-6 ESA-listed Plant and Wildlife Survey Results (Scheuerman and Camacho 2022)

Mariana Fruit Bat/ fanihi (*Pteropus mariannus)*

Population Estimates

The following terms are defined to ensure clarity as it relates to the discussion of the species life history and measures described below. These terms are based on communications with Dr. Tammy Mildenstein (PhD with a focus on the conservation of globally endangered fruit-eating flying foxes).

Colony – a population of bats (assumed to be interbreeding) aggregating at a particular roosting location. Individuals within the colony have strong fidelity to the colonizing population and to the roost site. If the roost is disturbed, a colony will most often relocate to a different roosting site as a group.

Roost – the location to which a colony of fruit bats returns, after nocturnal foraging, to spend the day resting and interacting. Roosts generally are where the breeding population (i.e., colony) meets up every morning and emerges from in the evening rather than where a singleton or small group may temporarily rest.

Foraging – the action of searching for food away from the roost site.

Foraging locations - any area where bats search for food (this generally refers to areas within a bat's habitat used regularly (seasonal or periodic)). Foraging locations may still be close to the roost site.

Stop over locations – the locations outside of the roost site where bats may stop flying and hang (usually in a tree canopy) either to forage or rest or interact with other individuals (the term is used to differentiate a regularly used roost site by the colony from various locations that bats may hang out during their night time foraging flights).

Mariana fruit bats are a large-bodied colonial tree-roosting species. On Guam, nine roost sites were recorded within 100 meter of the 80-180 meter high cliff line on the northern part of the island (Wiles 1987). Mariana fruit bats are at their roost during the day and the colonies established by one or more bats can grow to over 1,000 individuals. Breeding is suspected to occur year-round with mother bats carrying their pups while foraging until they become too heavy. Males generally do not contribute to parental care (Safi 2008). When the pups become too heavy to be carried, the young bats that are not well developed enough to fly on their own are left at the roost while the adults forage at night.

Fruit bats need a good sense of vision, because when they forage at night for nectar and fruit, they orient by vision and the sense of smell. During the flights to the foraging grounds at dusk and the return to the daytime roost at dawn, the animals navigate solely by vision. On moonless nights, fruit bats cannot fly and stay hungry (Müller, 2007). The foraging behavior of the Mariana fruit bat has not specifically been assessed, but bats in similar habitat are known to visit two to five fruit trees per night, making five to seven flights of 492 to 2,625 ft (150 to 800 m) between the fruit trees, for an estimated maximum nightly travel distance of 0.6524 to 2.485 miles (mi) (1.05 to 4 kilometers [km]). During their nights away from their day roost tree, fruit bats can also fly for longer periods in search of new food sources and spend long periods roosting in trees other than fruit trees (Morrison 1980).

Sensitivity to Disturbance

Mariana fruit bat behavior may be influenced by human presence or activity, however it is noted in conjunction with threats to the animal at the colony.

Illegal hunting is a threat to Mariana fruit bats on all islands. Because hunting pressures on *P. m. mariannus* were more intense on Rota, bats at their roosts on this island were extremely sensitive to the odors and presence of humans nearby (e.g., from distances of 150 m away). Often this resulted in bats quickly leaving and/or circling the roost. The fruit bat population on Rota was in steady decline before 2009 when increased law enforcement resulted in an immediate decrease in illegal hunting at maternity colonies (USFWS 2012).

As noted in '*Population Assessment of the Mariana Fruit Bat (Pteropus mariannus) on Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Asuncion, and Maug'* (Valdez 2010)

> *"From our observations of bat behaviors on the NMI during this study, it appears that colonies P. m. mariannus were not as sensitive to the scent or quiet presence of people. Most of the time, the MFB team was able to conduct counts from distances less than 50 m. Reasons for this may be attributed to the lesser hunting pressures in the NMI compared to Rota. In some instances, bats were observed leaving during their evening departures from their roosts to forage and would land above observers and even by established base camps (e.g., at Agrihan) where food resources were available (e.g., ripe mango fruits). During these instances, many of the bats were aware of the presence of people, but did not fly away and/or continued to eat. When bats were inadvertently flushed, as a result of researchers cutting trails or hiking through forest habitat searching for roosts and making a fair amount of noise, they generally would return to their original roost."*

This is consistent with observations on Guam where during a 2012 study the observers documented three incidental encounters with Mariana fruit bats where the observers were able to get within 5 to 21m of roosting bats. During all three incidental encounters, the Mariana fruit bats (2 individual males and one male and one female) eventually departed their roost site but only after considerable time had passed (30 to 69 minutes) despite the presence of one or two observers (SWCA 2012). In June of 2023, a bat was observed in the Caiguat forest enhancement site while a team was working to clear transects with chain saws. The bat was observed 250 feet from the chain saw crew. The team stopped work, then the bat moved closer to observe the crew (approximately 100 feet) to a *Cocos nucifera*. The bat was not foraging and spent approximately 10 minutes between each tree. Work resumed once the bat left the area. The following day, a bat flew directly over the chain saw crew while they were working. The bat flew within 30-40 feet of the chain saw crews at its closest point. Once the bat was observed, all work stopped and everyone remained still. The bat did not land and work resumed approximately five minutes after the sighting.

Bat sensitivity is further documented with species of flying foxes in Queensland and New South Wales. Over a number of decades, both Queensland and New South Wales have formed flying fox consultative committees to work on identifying control methods to discourage the bats from foraging within mango and papaya orchards. The findings found that flying foxes will become accustomed to smell, sounds (if they are not met with real danger) and light (lights can be

initially successful, however flying foxes become accustomed to the light and will feed in a fully illuminated orchard) (Queensland Government, Department of Primary Industries and Fisheries, 2023).

As Mariana fruit bats do not use laryngeal echolocation, instead relying on vision and smell to avoid obstacles and locate food sources (Almeida et al. 2014), noise from construction and aircraft does not appear to have a negative effect on them. A study published in 2023 involved placing several microphones within fruit bats roost and found that the animals are exposed to social calls at levels that exceed ~100 decibels sound pressure level every ~5 minutes, accounting for more than 100,000 recurrent exposures per year (Tarnovsky, et. al 2023). There was a colony of fruit bats at Pati Point (1980-2010) which was on the approach corridor of Andersen Air Force Base and within the 80-85 decibel day night level (Wiles 1987). There are three known colonies on Guam: on AAFB at the top of the cliff line above the combat arms training and maintenance (CATM) range (US Navy 2022), near Tarzan Falls and on Cocos Island (Mildenstein 2024). It is of note that the location of the colony site is above (south of) the CATM range and north of the AAFB airfield. The CATM ranges supports training with pistols, rifles, machine guns up to 7.62 millimeters, and inert mortars up to 60 millimeters. Training is also conducted with the M203 40-millimeter grenade launcher using inert training projectiles only (DON 2010). This would seem to indicate that the sight, smell or sound of humans and the noise related to the use of the range (pistols, rifles, machine guns, mortars and grenade launchers) does not deter the establishment of a colony and instead roost selection is focused on site security and protection from poaching. Wild animals are usually expected to either avoid or habituate to high-impact noise (Pepper et al. 2003). In the case of Guam's Mariana fruit bat, there may be a tradeoff between high quality roosting sites (i.e., sheltered from weather, close to food sources, and protected from hunters) and the level of noise that will be tolerated (SWCA 2012).

Status of the Species within the Region of Influence

Although no individual Mariana fruit bats were observed during the 2021 surveys, evidence (ejecta) of bat foraging and/or stop over activity in the ROI was observed in three separate locations (Scheuerman and Camacho, 2022). The 2021 surveys documented the presence of bats within the recreational access road and jeep trail improvement areas (approximately 600 feet from the proposed facilities construction site), and within the demolition area (less than 30 feet from the existing facilities). Previous surveys by staff at the Refuge detected bats less than 200 feet from the demolition area boundaries, another sighting at 250 feet southeast of utility realignment along Highway 3A or 800 feet northeast of the proposed new facilities, and a sighting 750 feet east of the demolition area (Figures 3-4 and 3-6) (DON 2015; NAVFAC Marianas and AAFB 2015) however, bats are rarely observed on the Refuge (Dawn Bruns and Toni Mizerek, USFWS and Coralie Cobb, DON, personal communication, June 2023).

Tree snails (Partula radiolata, Partula gibba and Samoana fragilis)

No occurrences of the humped tree snail *(Partula gibba)* or fragile tree snail *(Samoana fragilis)* were recorded; however, these species in juvenile stages are difficult to distinguish from one another and from the Guam tree snail *(Partula radiolata)* and therefore are considered to have the potential to occur in the ROI (Hopper and Smith 1992; USFWS 2020a, 2020b). The

remaining discussion focuses on the Guam tree snail as it was positively identified during the 2021 surveys and all other known surveys on the Refuge.

Population Estimates

The following information is from the 5-Year status review for the Guam tree snail (USFWS 2020c):

The Guam tree snail is a member of the Partulidae family that is endemic to Guam. Relatively little is known about the biology and life history of the Guam tree snail. Information about the basic requirements, reproductive output, survival rates, longevity, and feeding behavior is needed. Generally, the Guam tree snail needs cool, shaded forest habitat with high humidity and reduced air movement that prevents excessive water loss. The snails do not appear to require specific host plants, but can be found on many different species of large-leaved plants (trees, shrubs, herbaceous plants, and even ferns), both native and introduced. They need live and decaying plant material, as their diet consists of fungi and microalgae (USFWS 2020c)."

For purposes of this consultation, the term "home plant" is defined to ensure clarity as it relates to the conservation measures. There aren't any obligate associations between federally listed tree snails and specific trees or shrubs. All three federally listed tree snail species are flexible in the plants they occur upon, using both native and non-native plants. The only general pattern is that they are more likely to be found on broad leafed plants that form dense canopy or are under dense canopy (Fiedler 2019).

Currently, the Guam tree snail is distributed across Guam in potentially more than 50 locations and populations range from a few individuals to a few thousand, though overall numbers have not been quantified (USFWS 2020c). For all three species, the number of tree snail individuals per location has rarely been reported and has typically been anecdotal (USFWS 2020a, 2020b, 2020c). Changes in population and location of sites occupied may reflect differences in survey efforts or differences in definition of population and may not represent changes in abundance; therefore, systematic comparisons of abundance over time are not possible (USFWS 2020a, 2020b, 2020c).

There have not been systematic, repeated surveys to quantify changes in either population or abundance of tree snails in the Marianas. Past surveys have differed on methodology and population definitions, making it difficult to compare efforts across years to determine trend. In order to standardize Partulid snail survey methods, Dr. G. Curt Fiedler described snail survey methods under a cooperative agreement with Naval Facilities Engineering Command in December of 2019. Two survey methodologies are described in the report: detection surveys and population estimate surveys.

The purpose of a detection survey is not to count snails but to document their presence and, if possible, delineate where they occur. Hopper and Smith (1992), Smith et al (2008) and Ngiratregd & Fiedler (2016 unpublished report) indicated that when a search team began its search for tree snails within an area, if no snails were found in the first five minutes, snails probably weren't present.

On Andersen Air Force Base, there have been searches of seven plots (four at Tarague Beach and three by the Andersen Air Force Base golf course). Tarague Beach has been sampled two times in the dry season and two times in wet season. The golf course has been sampled once during the dry season. Each sampling period is five searches/capture events and has resulted in 100% detection of snails at the plots (S. Vogt, pers. comm. 2023). Detection rates for the *P. radiolata* on the Tarague plots ranged from 5% to 29% with a mean of 16% (95% ci, 11%-22%). The Tarague Beach population was surveyed in 2020/2021 as part of a plant and invertebrate survey that covered approximately 325 acres. The Guam tree snail population was found within an area encompassing 9.88 acres.

Another detection survey at the Skaggs Urban Training Complex (former Andersen South) in 2019 salvaged and translocated a total of 3,854 *Partula radiolata* snails from seven salvage areas within 212 acres planned for development as part of the Marine Corps relocation program (HDR, 2021).

In 2020 and 2021, 1,800 acres of the Skaggs Urban Training Complex was surveyed and four populations of Guam tree snails with 187 snails (University of Guam, 2022) were found. The four populations included the seven salvage areas.

These surveys demonstrate that the tree snail population is not evenly distributed throughout the landscape and it's not necessary to count every snail, only to detect and note snails where they occur (Fiedler 2019).

Status of the Species within the Region of Influence

Guam tree snails were abundant in the coastal, lowland portions of the ROI during the 2021 surveys.

In total, 320 individuals were mapped within the ROI in 2021. The 2021 surveys were not comprehensive but instead focused on mapping the extent of the population. Guam tree snails were common in portions of the ROI mapped as coconut forest and were particularly common along the strip of the ROI that parallels the beach (Figures 3-4 and 3-5). This portion of the ROI is bisected by a dirt road that the public can use to access day-use sites within the Refuge. No Guam tree snails were observed within the 6-acre replacement facilities area (Scheuerman and Camacho, 2022) in 2021 in the higher elevation plateaus that are mapped as mixed limestone forest-plateau/secondary and consist of karst topography. In addition, no Guam tree snails were observed in the easternmost portions of the ROI, specifically in the more developed/disturbed areas surrounding the existing Refuge buildings and mowed/maintained vegetation.

In 2023, the Refuge relocated over 1,000 Guam tree snails from along the Recreational Access Road that parallels the beach. After Typhoon Mawar, the Refuge encountered blocked roads and trails, numerous twisted, fallen trees, and major coastal erosion. The Guam tree snails were displaced from the typhoon, but safely relocated before any areas were cleared of large branches and debris. Volunteers and summer interns helped identify Guam tree snails for relocation (USFWS 2023).

Mariana Eight-Spot Butterfly (*Hypolimnas octocula marianensis*)

Population Estimates

The following information is from the 5-Year Review Summary and Evaluation - Mariana eight-spot butterfly (Hypolimnas octocula marianensis)

"The Mariana eight-spot butterfly is recorded from approximately fourteen locations on Guam. However, researchers estimate the species only consistently occurs at between 6 to 10 known locations that contain larger aggregations of the two host plant species. During the vast majority of the historical and recent observations, the butterfly only occurs within close proximity of its two host plant species. The majority of known host plant locations occur on extremely rugged karst terrain known as pinnacle karst that affords protection from feral ungulates, particularly Philippine deer (*Cervus mariannus*). In only a few known locations, with apparently lower feral ungulate activity, do host plants grow on less extreme karst terrain. According to researchers familiar with the butterfly and our own analysis, it is possible that the primary occurrences of the host plant species represent distinct populations or that species exists as a meta-population on Guam taking advantage of the temporal and patchy distribution of its remaining habitat (USFWS 2017; Rubinoff and Holland 2018)."

Population sizes of this species are not well documented, however, habitat loss (such as due to typhoons, non-native plant populations, and development) and fragmentation along with reduced connectivity between host plant populations is a likely cause for the species' presumed low numbers (USFWS 2020d). The species is also at risk due to predation by ants and parasitic wasps (USFWS 2020d).

Status of the Species within the Region of Influence

No occurrences of Mariana eight-spot butterfly (*Hypolimnas octocula marianensis*) were documented in the ROI during the 2021 surveys (Scheuerman and Camacho 2022). *Procris pedunculata* and *Elatostema calcareum* are host plants for the butterfly's reproduction as well as a food source for larvae (Schreiner and Nafus 1996). Adult butterflies are generally observed in proximity to these larval stage host species (Rubinoff and Holland 2018; Demeulenaere et al. 2018). An individual host plant (*P. pedunculata*) was observed growing on a near-vertical cliff 30 feet outside of the ROI in 2021, in an area that is not included in the project area (Figure 3-5) (Scheuerman and Camacho 2022). Other known locations of host plants were identified in previous surveys conducted in 2012 and 2013. Those surveys documented Mariana eight-spot butterfly host plant *E. calcareum* on steep topography outside of the ROI boundaries, specifically, one plant 225 feet northwest of the proposed new facilities, three plants 275 feet northwest of the utility realignment on Highway 3A near the 2021 *P. pendunculata* observation, and two plants within 150 feet south of the demolition area to be prepared for restoration and regeneration (see Figures 3-2 through 3.2-6) (NAVFAC Marianas 2013; NAVFAC Pacific 2013; University of Guam 2014). Observations of adults, eggs, and chrysalis on these host plants were documented along the cliffline (approximately 1,000 feet southeast of the ROI) and current data on the status of these plants or the use of them by the butterfly is not available (see Figures 3-2 through 3-6) (NAVFAC Marianas 2013; NAVFAC Pacific 2013; University of Guam 2014). Due to ungulate presence and their well-documented damage to accessible vegetation via trampling or consumption, host plants for the Mariana eight-spot butterfly are unlikely to occur

in areas unprotected by significantly steep topography, such as near-vertical cliffs (USFWS 2014b).

Green Turtle (Chelonia mydas)

Population Estimates

The Central West Pacific Distinct Population Segment (DPS) of the green turtle is federal ESA-listed as endangered. On Guam, green turtles are Guam ESA-listed as threatened. There is no current population estimate for green turtles on Guam.

During the nesting season, which for Guam is typically from February through September or October, female green turtles emerge from the sea to lay an average of 110 to 130 eggs per clutch in large sandpit nests near vegetation above the high water line. After incubating for 50 to 80 days, 2-inch (5-centimeter) turtle hatchlings emerge from the nest and return to the ocean. An individual female can lay as many as seven clutches of eggs in successive 10 to 12 day intervals over a several-month season.

However, individual green turtles do not nest every year, and the frequency of nesting on Guam is unknown but estimated at 3 to 4 years at a rookery in Yap (NAVFAC Marianas and Andersen AFB 2017). Green turtles will return to the same beach to nest, if possible.

Status of the Species within the Region of Influence

Green turtles have been documented nesting and hauled out on beaches along Ritidian Point at the Refuge (NAVFAC Marianas 2013; NAVFAC Pacific 2013). Sea turtles hauled out on the beach have been described as sensitive to human presence, leaving their resting positions and returning to the water when people are nearby (J. Horeg, personal communication, July 10, 2023). Between January 2017 and April 2024, at least 66 sea turtle nests were documented at the Refuge from the western boundary to the sandy area in front of the administration building (Figures 3-4, 3-5 and 3-6). In 2018, there was no staff capacity for surveys so it is unknown how many nests existed. Each sea turtle nest identified is protected with education signs and flagging to reduce human exposure.

Fadang (Cycas micronesica)

Population Estimates

The following information is from the 5-Year status review for the *Cycas micronesica* (USFWS 2020e):

"There are approximately 32 populations of *C. micronesica* across four islands or island groups. The total number of individuals range wide is less than 700,000 with an estimated 396,000 in the Mariana Islands. The remaining nearly 300,000 are throughout Palau and Yap."

"Cycas micronesica is a gymnosperm, usually an unbranched tree with a thick trunk. Adult stem range between 26 to 39 feet (ft) (8 to 12 meters (m) in length and 5.5 to 49 inches (in) (14 to 25 centimeters (cm) in diameter. Leaves are glossy, pinnate (leaflets are attached along an extension

of the petiole), 3.3 to 6.5 ft (1 to 2 m) long, and restricted to the top of the trunk (Stone 1970; Raulerson and Rinehart 1991; Hill 1994). *C. micronesica* is a dioecious species (the male and female reproductive systems occur on separate plants). Male trees bear an elongated, upright cone in the center of the leaves; the woolly scales of the cone produce quantities of pollen. When the pollen is mature the cone is very strongly scented. The female trees also produce a central cone-like structure that opens outward to reveal individual tan, soft, woolly leaves that are deeply lobed and toothed and bear ovules in notches along the margins. If the ovules are fertilized by pollen, glossy, large hard-shelled brown seeds develop on the leaves (Stone 1970; Raulerson and Rinehart 1991; Hill 1994; Donnegon et al. 2004). Cones of *C. micronesica* emits chemical cues to attract specialist insects, primarily Anatrachyntis sp. (Lepidoptera: Cosmopterygidae), for pollination (Schneider et al. 2002, Terry et al. 2009); however, there is also evidence of wind as a pollen vector in open areas or forested areas with some wind on Guam (Terry et al. 2009; Hamada et al. 2015). Many plants reach the pollination phase between April and early August, which coincides with the middle to end of the dry season, when trade winds buffeting the island are consistently E to ENE, and the beginning of the wet season, when winds become more variable (Hamada et al. 2015). The average age at sexual maturity of naturally-occurring *C. micronesica* plants has not been documented; although reproductive parts appear after three years on propagated *C. micronesica* plants in the Guam Plant Extinction Prevention Program (GPEPP) nursery (GPEPP 2019, in litt.). Mature plants may live up to 40 years (IUCN 2010)."

The following information is from the Joint Region Marianas Integrated Natural Resources Management Plan (DON 2019):

"*Cycas micronesica* is listed as threatened under both the federal and Guam ESAs. Based on a forest inventory conducted in 2002, *C. micronesica* was the most abundant tree on Guam (Donnegan et al. 2004). Beginning in 2003, at least four species of arthropod pests that feed on *C. micronesica* plants have decimated the population: the non-native cycad scale (*Aulacaspis yasumatsui*), leaf miner (*Erechthias* sp.), cycad blue butterfly (*Chilades pandava*), and the native longhorn beetle (*Dihammus marianarum*). Guam's populations of feral pigs and deer also feed on *C. micronesica* plants. Leaf damage caused by deer herbivory is not consequential, but feeding on stem tissue by pigs is a major threat to plants that are first damaged by one of the invasive insect pests. The habitats that contained the highest plant densities in pre-invasion years (350-400 plants/hectare) sustained about 230 plants/hectare in early 2016. Mortality has been consistent for about four years, with the habitats containing the highest plant densities continuing to lose 20-30 plants/hectare per year. Currently, across the majority of Guam, there are no seedlings or juvenile plants in the population, and the remaining live trees are in poor health and show signs of damage from one or more of the insect arthropod pests. Seed production is low, germination rate is minimal, and the few seedlings."

In 2002, the Forest Inventory and Analysis Program estimated the Guam island-wide cycad population using 46 permanent field plots serving as a baseline. In 2012, cycad populations were re-monitored to detect change since 2002. In the 10 years between field studies, the population estimate decreased from 1,571,556 to 624,000 individuals (range including sampling error: 382,000-866,000) (Donnegan et al. 2004; Lazaro et al. 2013). This represents an average annual

rate of decline of 8.1% (5.8%-13.2%). By applying this rate of decline to the 2012 estimate of cycads, there are approximately 344,000 (123,000-538,000) cycads on Guam in 2020.

Status of the Species within the Region of Influence

During the 2021 surveys, a total of 182 *C. micronesica* individuals were recorded in the ROI, with 71 occurring within the 6-acre replacement facilities area and 24 occurring within the Highway 3A utility realignment areas for a total of 95 trees in the overall project area (Figures 3-3, 3-4 and 3-5) (Scheuerman and Camacho 2022). Individuals are common throughout the higher elevation limestone forest/woodland portions of the ROI, which are generally mapped as mixed limestone forest-foreslope consisting of karst topography. Portions of the ROI near the beach are mapped as coconut forest and mixed herbaceous scrub that have sandy soils and do not contain any *C. micronesica*. No *C. micronesica* seedlings were observed in the ROI; all individuals observed were fully developed and considered to be in an "adult" stage.

Of the 182 documented individuals in the 2021 survey area (Table 3-2), 54 were observed to be in poor or dead condition (Scheuerman and Camacho 2022). Within the focus area for new DOI facilities, 55 of the 71 individuals were in good or fair condition and 16 were dead or in poor condition; within the Highway 3A utility realignment areas, 14 of the 24 individuals were in good or fair condition, and 10 were dead or in poor condition (Scheuerman and Camacho 2022). Those individuals in poor or dead condition were indicated to be suffering from infestation by the Asian cycad scale (*Aulacaspis yasumatsui*) (Scheuerman and Camacho 2022).

In 2024, 16 additional *C. micronesica* individuals were recorded in the ROI within the waterline alignment and within the 6-acre replacement facilities area. The condition of the plants was not recorded but will be evaluated prior to construction based on Appendix B.

Table 3-2 Condition of Cycas micronesica within the ROI

Species	Good	Fair	Poor	Dead	Unknown	Total
Cycas micronesica	64	64	37	17	16	182

The condition of the plants was evaluated as the influence of health status of the individual cycad plant that is transplanted or used as a source for stem cuttings is critical on the success rates of horticultural procedures (Marler 2023). The basis for the health determination is as follows:

- Good: Strong vigor, full to nearly-full crown, healthy leaf appearance. Sixty-four total mapped in survey area.
- Fair: Some signs of loss of vigor, sparse crown often with epiphyte presence, some leaf discoloration. Sixty-four total mapped in survey area.
- Poor: Weak stature, crown nearly absent or overtaken by epiphytes, many dead or discolored leaves. Thirty-seven total mapped in survey area.
- Dead: No leaves (if any, all dead), trunk still standing but with signs of decay. Seventeen total mapped in survey area.

Dendrobium guamense

Population Estimates

The following information is from the 5-Year status review for the *Dendrobium guamense* (USFWS 2020e):

Dendrobium guamense is an epiphytic orchid endemic to the Mariana Islands, and is believed to have been historically widespread throughout the native forests of these islands. The current abundance has been reduced because of the loss and degradation of forest ecosystems across the islands that the species depends on. The estimated number of individuals across the species range is 6,206. Demographic features or trends are unknown for *D. guamense*

Status of the Species within the Region of Influence
A single *D. guamense* individual is known to occur on an *Intsia bijuga* (ifit) branch above the Highway 3A access road within the area proposed for utility realignment (Figures 3-2 and 3-3) (Scheuerman and Camacho 2022). The species typically occurs within lowland/limestone forests and savanna.

Serianthes nelsonii

Population Estimates
The following information is from the 5-Year status review for the *Serianthes nelsonii* (USFWS 2020f):

Serianthes nelsonii is a large forest tree endemic to the southern Marianas Islands, known to occur only on Guam and Rota (Costion & Lorence 2012). The species, known locally as Håyun lågu (on Guam) or Trongkon guåfi (on Rota) is among the largest of trees in the native limestone forest community, with thick spreading limbs and recorded heights in excess of 30m. Historically, on Guam the species is known primarily from the limestone forests in the northern half of the island, with some occurrences in the volcanic south as well.

In 2020, there was 1 (+37 seedlings) wild individuals on Guam and 48 wild individuals on Rota. There were 11 transplanted individuals on Guam and 74 transplanted individuals on Rota.

Status of the Species within the Region of Influence
There is one known *S. nelsonii* within the proposed site preparation area for restoration and regeneration in the vicinity of the existing facilities, which is actively managed by Refuge staff (Figures 3-5 and 3-6) (Scheuerman and Camacho 2022). The known individual is an out-planted, fenced-off sapling with signage indicating it is an endangered tree. The sapling is in poor condition with low leaf growth and vigor, occurring in an area mapped as mixed herbaceous scrub adjacent to a mowed/manicured area.

Tabernaemontana rotensis

Population Estimates
The following information is from the 5-Year status review for the *Tabernaemontana rotensis* (USFWS 2020g):

When *Tabernaemontana rotensis* was listed as endangered in 2015, it was known from seven populations within the forest habitat and totaling approximately 21,000 individuals (including seedlings, immature and mature plants) on Guam (M and E Pacific Inc. 1998; UOG 2007) and nine individuals on Rota (USFWS 2015) (USFWS 2020g). The 5-Year review for the species notes "Additional individuals have recently been located on Guam due to surveys by Guam Plant Extinction Prevention Program (GPEPP) and surveys funded by the DoD as military activities increase on this island. The current known abundance of *T. rotensis* on both Guam and Rota is approximately 15,341 naturally occurring individuals, including seedlings, immature and mature plants. *T. rotensis* occurs in eight locations on Guam. *T. rotensis* occurs in two locations on the southern half of the island and at six locations on the northern half. Despite a slight increase in the estimate of the number of populations, population size estimates appear to be in decline. On Rota there are nine individuals spread across six locations around the western, southern, and eastern parts of the island (CNMI DLNR 2015, in litt). Additionally, there are 30 surviving outplanted individuals spread across Rota (J. Manglona, T. Reyes, R. Ulloa, pers. comm. 2014 cited in CNMI DLNR 2015, in litt.). Three of these locations (AAFB-HMU, US Naval Magazine and Ipan) have a limited number of individuals (≤5 individuals) (USFWS 2020g)."

Status of the Species within the Region of Influence

Two stands of *T. rotensis*, totaling 23 individuals, were observed and mapped during the 2021 surveys. The two stands were within 10–30 feet from the Highway 3A utility realignment areas, and none within the new facility focus area (Scheuerman and Camacho 2022). One of the stands (four individuals) appeared to be planted and maintained in the past (Figures 3-4 and 3-5). Two small trees and a sapling looked to be in good health; however, one individual was dead (no live vegetation). There was a dilapidated wire fence around the stand that was fallen over, and there were remnants of old irrigation tubing. After speaking with Refuge staff, it was noted that this stand of *T. rotensis* is no longer actively managed or irrigated.

The other stand (19 individuals) that was observed and mapped adjacent to the roadside along Highway 3A into the Refuge, contains relatively healthy-looking small trees (Figure 3-3), approximately 10−15 feet in height, and showing signs of new/continuous leaf production. It is not known if these individuals were planted in the past, or if this stand is naturally occurring.

Critical Habitat for the Mariana Fruit Bat, Guam Kingfisher and the Mariana Crow on Guam

In 2004, the U.S. Fish and Wildlife Service designated approximately 376 acres (ac) (152 hectares (ha) of critical habitat on the island of Guam for the Mariana fruit bat, Guam kingfisher and the Mariana crow (USFWS 2004). The primary constituent elements of critical habitat for the Mariana fruit bat and both of the birds can be found in limestone, secondary, ravine, swamp, agricultural, and coastal forests on Guam that exhibit the biotic and structural characteristics necessary for foraging, sheltering, roosting, nesting, and rearing of young of the Mariana fruit bat, Guam kingfisher, and Mariana crow on Guam (USFWS 2004). Only lands containing one or more of the primary constituent elements are designated as critical habitat. Existing features and structures within the boundaries of the mapped units, such as buildings, roads, aqueducts,

antennas, water tanks, agricultural fields, paved areas, lawns, and other urban landscaped areas do not contain the primary constituent elements and therefore are not designated as critical habitat.

Specific details of primary constituent elements for each species are described below.
The primary constituent elements required by the Mariana fruit bat for the biological needs of foraging, sheltering, roosting, and rearing of young are found in areas supporting limestone, secondary, ravine, swamp, agricultural, and coastal forests composed of native and introduced plant species. These forest types provide the primary constituent elements of:

(1) Plant species used for foraging, such as *Artocarpus* spp. (breadfruit), *Carica papaya* (papaya), *Cycas micronesica* (fadang), *Ficus* spp. (figs), *Pandanus tectorius* (kafu), *Cocos nucifera* (coconut), and *Terminalia catappa* (talisai) and

(2) Remote locations, often within 328 ft (100 m) of clifflines that are 260 to 590 ft (80 to 180 m) tall, with limited exposure to human disturbance and that contain mature fig, *Mammea odorata* (chopak), *Casuarina equisetifolia* (gago), *Macaranga thompsonii* (pengua), *Guettarda speciosa* (panao), and *Neisosperma oppositifolia* (fagot), and other tree species that are used for roosting and reproductive activity.

The primary constituent elements required by the Mariana crow for the biological needs of foraging, sheltering, roosting, nesting, and rearing of young are found in areas that support limestone, secondary, ravine, swamp, agricultural, and coastal forests composed of native and introduced plant species. These forest types provide the primary constituent elements of:

(1) Emergent and subcanopy trees with dense cover for breeding such as fagot, pengua, ifit, *Premna obtusifolia* (ahgao), *Eugenia reinwardtiana* (aabang), fig, *Elaeocarpus joga* (yoga), and *Tristiropsis obtusangula* (faniok); and

(2) Sufficient area of predominantly native limestone forest to allow nesting at least 950 ft (290 m) from the nearest road and 203 ft (62 m) from the nearest forest edge and to support Mariana crow breeding territories (approximately 30 to 91 ac (12 to 37 ha)) and foraging areas for nonbreeding juvenile crows; and

(3) Standing dead trees and plant species for foraging, such as *Aglaia mariannensis* (maypunayo), breadfruit, coconut palm, fagot, *Hibiscus tiliaceus* (pago), ifit, *Leucaena* spp. (tangantangan), *Ochrosia mariannensis* (langiti), kafu, ahgao, fig, and joga.

The primary constituent elements required for the Guam kingfisher for the biological needs of foraging, sheltering, roosting, nesting, and rearing of young are found in areas that support limestone, secondary, ravine, swamp, agricultural, and coastal forests containing native and introduced plant species. These forest types include the primary constituent elements of:

(1) Closed canopy and well-developed understory vegetation; large (minimum of

approximately 17 in (43 cm) dbh), standing dead trees (especially faniok, *Pisonia grandis* (umumu), breadfruit, fig, and coconut palm); mud nests of *Nasutitermes* spp. termites; and root masses of epiphytic ferns for breeding;
(2) Sufficiently diverse structure to provide exposed perches and ground surfaces, leaf litter, and other substrates that support a wide range of vertebrate and invertebrate prey species for foraging kingfishers; and
(3) Sufficient overall breeding and foraging area to support kingfisher territories of approximately 25 ac (10 ha) each.

Status of the Critical Habitat within the Region of Influence

The proposed action encompasses approximately 10.75 acres of critical habitat. The critical habitat acreage is based on the primary constituent elements and excludes all existing facilities, roads, paved areas, and urban landscaped areas.

The existing DOI facilities are not within critical habitat as the area is an "existing facility" with "roads, paved areas, and urban landscaped areas." The existing DOI facilities encompass approximately 1.4 acres.

The Refuge considers the critical habitat impacted by the new construction to be of poor quality. Poor quality critical habitat is based on the lack or reduced amount of the primary constituents elements – few foraging or breeding plant species, increased numbers of invasive plant species and proximity to human presence. The greater amount of invasive plants, the fewer plants supporting foraging or breeding in an area and close proximity to human disturbance results in the lowest quality habitat. The site of the new facility does not provide the distance from disturbance that is beneficial to species since it is along a road. The area was also preferred for construction because of the number of invasive plant species and lack of protection from ungulates degrading the native forest quality. The existing DOI facilities to be demolished are not within critical habitat as the area is an "existing facility" with "roads, paved areas, and urban landscaped areas."

No areas of the Refuge are currently protected from ungulates. The area of Refuge that currently has the highest quality critical habitat is on the eastern side with the most native and PCE plant species, fewest invasive plants, fewest people and is farthest from any road but does not have any protection from ungulates so recruitment is low. By netting a large area in the currently highest quality critical habitat, the goal is to help ensure the greatest potential for keeping high quality habitat and ensuring that some PCEs are available for dispersal once fanihi and birds are able to return.

The critical habitat is utilized by Mariana fruit bats as there was evidence (ejecta) of bat foraging and/or stop over activity in the ROI and elsewhere in the Refuge (Scheuerman and Camacho, 2022). However, as both the Guam kingfisher and Mariana crow are considered extirpated on Guam (USFWS 2020h and 2020i), the critical habitat is not considered occupied for either of these species.

This page intentionally left blank.

4 Effects of the Action and Cumulative Effects

4.1 Approach to Analysis

This chapter presents an analysis of effects of the action and the cumulative effects to listed species and the associated critical habitat. To be considered an effect of a proposed action, an effect of the action must be caused by the proposed action (*i.e.,* the effect would not occur but for the proposed action and is reasonably certain to occur).

As they relate to the federally listed species and critical habitat considered in this BA, direct and indirect effects from proposed activities within the Action Area have been evaluated herein based upon: (1) an understanding of the methods and equipment that would be used during construction and operation of facilities, (2) knowledge of the potential for such methods and equipment to disturb the natural resources on which the subject species depend, and (3) awareness of the types of effects that have resulted from similar actions in the past.

4.1.1 Likely to Adversely Affect Determinations

Cycas micronesica

There are 111 *C. micronesica* individuals within the new facility focus area and the road/utility-realignment (Scheuerman and Camacho 2022, and 2024 soil and topographic pre-survey), particularly along Highway 3A and east of the new facility construction site along the existing Urunao Road, identified in 2021, prior to Typhoon Mawar. Out of the 95 individuals documented within the project area in 2021, 69 trees were reported to be in healthy condition (36 trees in good condition, 33 trees in fair condition) at the time of the 2021 survey (Scheuerman and Camacho 2022). However, the Refuge has requested that all living *C. micronesica* be replaced regardless of the plant health. As the construction designs are finalized, the number of affected *C. micronesica* will be determined by the qualified biologist. This "x" number will be used to determine the number of plants needed to offset the impacts to the species.

Due to declining populations from the pressure of the Asian cycad scale, tree health conditions are subject to change and the total healthy trees eligible for transplant would be reassessed prior to construction (Section 2.3). Given the current projected rate of continued population decline (5.8%), it is expected that 69 plants identified in 2021 as being in good and fair condition will be reduced to 21 plants over the next 20 years in the absence of the project.

The Conservation Measures identified in Section 2.3 minimize the impacts of the proposed action on *C. micronesica* however, due to the adverse impacts to up to 69 *C. micronesica,* the project may affect and is likely to adversely affect the species.

Dendrobium guamense

One *D. guamense* individual was observed in 2021 on an ifit branch, above the Highway 3A access road (Scheuerman and Camacho 2022) (Figure 3-2). The plant's location is within the area proposed for utility realignment. The Conservation Measures include a proposal to clearly mark the host tree to prevent the host tree from being trimmed, removed, or damaged during

construction, which will protect the *D. guamense* on the host tree. However, due to the proximity of the host tree to the utility realignment, our determination is the project has the potential to adversely affect *D. guamense* in the event that the tree cannot be avoided during the utility realignment. The Conservation Measures identified in Section 2.3 minimize the impacts of the proposed action on *D. guamense*, however, due to the potential to impact the one plant, the project may affect and is likely to adversely affect *D. guamense.*

Mariana fruit bat

While bats are not commonly observed at the Refuge, evidence of bat presence is documented within the project area as well as in surrounding areas within the ROI (Figures 3-5 through 3-6).

Mariana fruit bats are largely nocturnal (resting/roosting during the day and most active at night); the species typically roosts with their colony in the same roosting locations, in mature trees (USFWS 2023b). The nearest potential bat colony is approximately five miles east of the ROI (NAVFAC Pacific 2023b). Foraging distances for *Pteropus* bats vary greatly and are not well documented for bats at the Refuge, but they are capable of traveling from the closest potential bat colony to forage within the ROI. Bat sign, documented in the 2021 survey, indicates that they do use the Refuge (Murugavel et al. 2023; Aziz et al. 2021; NAVFAC Pacific 2023b; Scheuerman and Camacho 2022). Potential impacts to the species include habitat loss, risk of strike, and light disorientation.

Mariana fruit bats primarily forage at night and rely primarily on vision and smell to avoid obstacles and locate food sources (Almeida et al. 2014).

A sufficient amount of suitable habitat exists for the bat within the northern part of Guam as part of the durable habitat protected within 5,234 acres of AAFB, providing alternate opportunities to the construction locations for foraging bats within the area. In addition, the implementation of the conservation measures (Section 2.3) would avoid and minimize any impacts to bats in the unlikely occurrence that any are present. The construction personnel would increase human presence relative to existing conditions (sight, smell, and sounds) but would be temporary and minimal as the Refuge is used by the 90,000 visitors per year (Guam National Wildlife Refuge (us-parks.com). All outside area lighting would be fully shielded to avoid impacts to Mariana fruit bats, meeting UFC 3-530-01 ratings to reduce illumination of sensitive habitats within the Refuge. The colors of lights used would be limited to wavelengths in the yellow, orange, and red spectrum to reduce negative impacts to bats. However, as the construction and demolition may occur at night, which has the potential to disrupt the foraging behavior of the Mariana fruit bat, the project has the potential to adversely affect the species.

Guam tree snail

In total, 320 individuals were mapped within the coconut forest and were particularly common along the road that parallels the beach (Figures 4-1, 4-2 and 4-4). This area is used by the 90,000 visitors per year that visit the Refuge (Guam National Wildlife Refuge (us-parks.com). No excavation, widening, or paving will occur on the Recreational Access Road and improvements would be limited to revising the existing turnaround area on the south end of the Recreational Access Road and end of Jeep Road.

Tree snails do not have the ability to move quickly or relocate from an area should there be disturbance due to construction, however, to minimize impacts to Guam tree snails a qualified biologist will inspect vegetation to be removed to confirm the plant does not contain a Guam tree snail. If a snail is found, the snail(s) will be collected and translocated to a suitable site on the Refuge. Translocation of Guam tree snails has been done successfully by biologists from the University of Guam, USFWS, the Department of Agriculture Division of Aquatic and Wildlife Resources and local contractors. The DON will coordinate with the Refuge in advance to identify potential snail translocation site(s).

Although there is minimal vegetation removal proposed within areas containing tree snail observations, if snails are identified in the project footprint translocation is proposed to minimize the long-term effect of the road improvements and the public access to the Refuge. However, the translocation of snails has the potential to adversely effect the species therefore, the impacts to the Guam tree snail may affect and are likely to adversely affect the species.

Tabernaemontana rotensis

There are two known populations of *T. rotensis* within the ROI (Scheuerman and Camacho 2022) (Figures 3-4 and 3-5). Both populations (a total of 23 individuals) would potentially be disturbed by the proximity of utility realignment along Highway 3A; however, such disturbance would be designed to avoid direct impact to these known tree locations. No direct impacts to *T. rotensis* are anticipated. However, due to the proximity of the two populations to the utility realignment, our determination is the project has the potential to adversely affect *T. rotensis* in the event that the trees cannot be avoided.

The Conservation Measures identified in Section 2.3 minimize the impacts of the proposed action on *T. rotensis* however, due to the potential adverse impacts to 23 individuals, the project may affect and is likely to adversely affect the species.

Critical habitat for the Mariana fruit bat, Mariana crow and Guam kingfisher (LAA)

The proposed action encompasses approximately 10.75 acres of critical habitat. The critical habitat acreage is based on the primary constituent elements and excludes all existing facilities, roads, paved areas, and urban landscaped areas.

The existing DOI facilities are not within critical habitat as the area is an “existing facility” with “roads, paved areas, and urban landscaped areas.” The existing DOI facilities encompass approximately 1.4 acres.

The critical habitat is utilized by Mariana fruit bats as there was evidence (ejecta) of bat foraging and/or stop over activity in the ROI and elsewhere in the Refuge (Scheuerman and Camacho, 2022). However, as both the Guam kingfisher and Mariana crow are considered extirpated on Guam (USFWS 2020h and 2020i), the critical habitat is not considered occupied for either of these species.

The Refuge considers the critical habitat impacted by the new construction to be of relatively poorer ecological quality to support listed species as compared with other areas on the Refuge. This is because the critical habitat in the area of the new construction has a reduced amount of the primary constituent elements – fewer foraging, breeding, roosting, nesting and sheltering plant species, increased numbers of invasive plant species and greater proximity to human presence. The greater amount of invasive plants, the fewer plants supporting foraging, breeding, roosting, nesting and sheltering in an area and close proximity to human disturbance results in the lowest quality habitat comparatively. The site of the new facility does not provide the distance from disturbance that is beneficial to species since it is along a road. The area was also preferred for construction because of the number of invasive plant species and lack of protection from ungulates degrading the native forest quality. The existing DOI facilities to be demolished are not within critical habitat as the area is an "existing facility" with "roads, paved areas, and urban landscaped areas."

No areas of the Refuge are currently protected from ungulates. The area of the Refuge that currently has the highest quality critical habitat is on the eastern side with the most native and PCE plant species, fewest invasive plants, fewest people and is farthest from any road but does not have any protection from ungulates so recruitment is low. By netting a large area in the currently highest quality critical habitat, the goal is to help ensure the greatest potential for keeping high quality habitat and ensuring that some PCEs are available for dispersal once fanihi and birds are able to return.

4.1.2 Not Likely to Adversely Affect Determinations

Green Turtle

Green turtles have been documented nesting and hauled out on beaches along Ritidian Point at the Refuge (NAVFAC Marianas 2013; NAVFAC Pacific 2013). Potential haul out and nesting habitat is within 900 feet of the nearest proposed facility construction site, within 100 feet or less of the Jeep Trail Road improvements, and within 200 feet of the proposed demolition area. Habitat loss is not an anticipated stressor to sea turtles, as no activities are proposed to occur on or near the beaches.

Information regarding exact noise disturbance thresholds of turtles on land is limited (National Oceanic and Atmospheric Administration 2023). Morphological investigations demonstrated that sea turtles have poor auditory receptors to airborne sound, with limited on-land hearing for low frequencies typically produced by ground construction (Piniak et al. 2016; Popper et al. 2014; Bartol and Ketten 2006). Therefore, airborne noise is not anticipated to disturb green turtles as potentially loud noise levels would attenuate by the time sound would reach a green turtle on the beach and hearing sensitivity is limited on land. Sea turtles in the water would not experience a change in type or magnitude of noise levels from construction, demolition, or Jeep Trail Road improvement activities (University of Rhode Island and Inner Space Center 2023). Temporary security and construction night lighting in the demolition area or Jeep Trail Road improvements area, and post-construction lighting at the proposed facility, would follow conservation measures to ensure artificial lights are not visible from the beach, and would avoid the possibility of the light to deter or disorient sea turtles from normal behaviors (USFWS 2023c). Additionally, colors of lights used would be limited to 600+ nanometer wavelength (yellow, orange, and red) with avoidance of blue and white lights (Witherington and Bjorndal 1991) (Section 2.3).

Due to the temporary nature of construction, demolition, and Jeep Trail Road improvements, the distance of the proposed action from sea turtle potential haul out locations, the characteristics of proposed construction noise, combined with the appropriate conservation measures in Section 2.3, the impacts to the green turtle would not likely to adversely affect the species.

Mariana Eight-Spot Butterfly

The proposed action would not impact host plants for the species; however, the various regions within the ROI where host plants have been observed collectively create sparse reproductive habitat for the Mariana eight-spot butterfly (see Figure 3-6). The species may traverse through the project area to reach the cliff habitats where host plants exist, as it has been documented that at least one life stage of the species typically occurs where host plants are present (Schreiner and Nafus 1996). Proposed activities in the ROI could also pose risk of strike to the species should it traverse the project area, however this is not reasonably certain to occur. However, because the species and host plants have not been observed within areas proposed for construction, the proposed action is not anticipated to directly impact individuals (Scheuerman and Camacho 2022). As such, occurrences of the species entering the ROI are anticipated to be minimal, and with the implementation of Conservation Measures listed in Section 2.3, the impacts to the Mariana eight-spot butterfly would be not likely to adversely affect the species.

Humped Tree Snail

No occurrences of the humped tree snail *(Partula gibba)* were recorded; however, this species in the juvenile stages is difficult to distinguish from the Guam tree snail *(Partula radiolata)* and therefore are considered to have the potential to occur in the ROI.

Because the species has not been observed within areas proposed for construction, the proposed action is not anticipated to directly impact individuals (Scheuerman and Camacho 2022). As such, occurrences of the species entering the ROI are anticipated to be minimal, and with the implementation of Conservation Measures listed in Section 2.3, the impacts to the humped tree snail would be not likely to adversely affect the species.

Fragile Tree Snail

No occurrences of the fragile tree snail *(Samoana fragilis)* were recorded; however, this species in the juvenile stages is difficult to distinguish from the Guam tree snail *(Partula radiolata)* and therefore are considered to have the potential to occur in the ROI.

Because the species has not been observed within areas proposed for construction, the proposed action is not anticipated to directly impact individuals (Scheuerman and Camacho 2022). As such, occurrences of the species entering the ROI are anticipated to be minimal, and with the implementation of Conservation Measures listed in Section 2.3, the impacts to the fragile tree snail would be not likely to adversely affect the species.

Serianthes nelsonii **(NLAA)**

One *S. nelsonii* individual in poor condition exists along the southwest perimeter of the existing facilities survey area (Figure 3-5 and 3-6). No disturbance is planned within the immediate vicinity of the existing *S. nelsonii* tree. In addition, with the implementation of Conservation Measures listed in Section 2.3, the impacts to the one *S. nelsonii* would be not likely to adversely affect the species.

5 Conclusion-Determination of Effect

The proposed action includes the demolition of existing DOI facilities, the reconstruction of DOI facilities within the Refuge, as well as associated infrastructure. The proposed action includes road improvements and development of an alternate public access route from the newly constructed facilities to the recreational portions of the Refuge, demolition of the existing DOI facilities, transplantation of threatened plant species to MCBCB, preparation of the demolition site for potential restoration and regeneration, and implementation of conservation measures. The proposed action is not anticipated to increase traffic, public visitation to the Refuge or parking along the beach road. The purpose of the proposed action is to provide DOI replacement facilities pursuant to Section 2822 of the 2015 National Defense Authorization Act (NDAA) and the 2020 Memorandum of Agreement (MOA) (Appendix A).

The proposed action may affect, likely to adversely affect *Cycas micronesica*/fadang*, Dendrobium guamense,* Mariana fruit bat/fanihi, Guam tree snails/akaleha', *Tabernaemontana rotensis,* and critical habitat for the Mariana fruit bat, Guam kingfisher/sihek and the Mariana crow/aga (Table 5-1). The proposed action is not likely to adversely affect humped tree snail/akaleha', fragile tree snail/akaleha', Mariana eight-spot butterfly/ababang, green turtle/haggan, or fire tree/hayun lagu.

Table 5-1 Determination of Effect for Federally Listed Species within the Action Area

Scientific name/Critical Habitat	Common name (English/Chamorro)	ESA Status	Effects Determination
Cycas micronesica	Fadang	Threatened	LAA
Dendrobium guamense	No common name	Threatened	LAA
Partula radiolata	Guam tree snail/ akaleha'	Endangered	LAA
Tabernaemontana rotensis	No common name	Threatened	LAA
Chelonia mydas	Green turtle/haggan (Central West Pacific distinct population segment)	Endangered	NLAA
Hypolimnas octocula marianensis	Mariana eight-spot butterfly/ ababang	Endangered	NLAA
Partula gibba	Humped tree snail/ akaleha'	Endangered	NLAA
Pteropus mariannus	Mariana fruit bat/ fanihi	Threatened	LAA
Samoana fragilis	Fragile tree snail/ akaleha'	Endangered	NLAA
Serianthes nelsonii	Fire tree/Hayun lagu	Endangered	NLAA
Critical Habitat for the Mariana fruit bat, Guam kingfisher and the Mariana crow	N/A	Designated	LAA

This page intentionally left blank.

6 References and Personal Communication

AAFB. 2008. Basewide Vegetation Survey, Mapping, and Report of Andersen AFB, Guam. Contract report prepared by e2M. August.

Aziz, S.A., K.R. McConkey, K. Tanalgo, T. Sritongchuay, M.R. Low, J.Y. Yong, T.L. Mildenstein, C.E. Nuevo-Diego, V.C. Lim, and P.A. Racey. 2021. The critical importance of Old World fruit bats for healthy ecosystems and economies. *Frontiers in Ecology and Evolution*, 9, p.181.

Almeida, F.C., N.P. Giannini, N.B. Simmons, and K.M. Helgen. 2014. Each flying fox on its own branch: a phylogenetic tree for Pteropus and related genera (Chiroptera: Pteropodidae). *Molecular Phylogenetics and Evolution*, 77, 83-95.

Bartol, S. and D.R. Ketten. 2006. Turtle and tuna hearing. In: Swimmer Y. and R. Brill (Eds), Sea turtle and pelagic fish sensory biology: developing techniques to reduce sea turtle bycatch in longline fisheries. NOAA Tech Memo NMFS-PIFSC-7, P 98-105.

Bruns, D., Mizerek, T. and C. Cobb. 2023. Personal communication. June.

Costion, C. and David Lorence. 2012. The endemic plants of Micronesia: a geographical checklist and commentary. Micronesica, 43 (1). pp. 51-100.

Demeulenaere, E., M. Putnam, and G.C. Fiedler. 2018. Conservation Management of the Mariana Eight Spot Butterfly. University of Guam.

DON. 2010. Final Environmental Impact Statement for Guam and Commonwealth of the Northern Mariana Islands Military Relocation, Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing, and Army Air and Missile Defense Task Force. July.

__. 2015. Final Supplemental Environmental Impact Statement Guam and Commonwealth of the Northern Mariana Islands Military Relocation (2012 Road Map Adjustments). May.

Donnegan, J., et.al. 2004. Commonwealth of the Northern Mariana Islands' Forest Resources.

DON. 2019. Integrated Natural Resources Management Plan for Joint Region Marianas. Prepared for Joint Region Marianas and NAVFAC Marianas, Guam by Cardno, Honolulu, HI. June.

Fiedler, G. Curt. 2019. Partulid Snail Survey Methods. Cooperative Agreement N40192-17-2-8005.

Government of Guam. 2009. Endangered Species Regulation No. 9. Department of Agriculture, Mangilao, GU. 6 November.

Guam Division of Aquatic and Wildlife Resources. 2006. Comprehensive Wildlife Conservation Strategy. Department of Agriculture, Government of Guam, Mangilao, GU. November.

Hamada, T., et. al., Habitats, Trade Winds, and Pollination of the Endangered *Cycas micronesica*: Is there a Role for Wind as Pollen Vector on the Island of Guam? 2015.

HDR. 2021. *Salvage, Transplanting, and Translocating Endangered Species Act Listed Plants and Snails at Urban Combat Training (J-755) Construction Site at Andersen South, Andersen Air Force Base, Guam*. Prepared for NAVFAC Pacific under Contract No. N62742-15-D-1822, Task Order N62742-18-F0113.

Hill, K.D. 1994. A taxonomic revision of the genus Cycas (Cycadaceae) in Australia.

Hopper, D.R. and B.D. Smith. 1992. Status of Tree Snails (Gastropoda: Partulidae) on Guam, with a Resurvey of Sites Studied by H.E. Crampton in 1920. Pacific Science, 46:77–85.

Horeg, J. Personal communication, July 10, 2023.

JRM. 2013. Final Joint Region Marianas Integrated Natural Resources Management Plan. Prepared by HDR for Commander Joint Region Marianas, Guam, Hagatna, GU. December.

JRM. 2022. Joint Region Marianas Integrated Natural Resources Management Plan. March.

King, R., M. Higgs, III, K. Bautista, and E. Leon-Guerrero. 2020. Using Local Early Action Planning (LEAP) to Inform Climate Vulnerability Assessments – Guam 2019. *Pacific Asia Inquiry*, 11.1:107. Fall 2020.

Lazaro, M. et.al., 2013. Guam's Forest Resources: Forest Inventory and Analysis.

Marler, T.E. 2023. Infestations of Aulacaspis yasumatsui Reduce Asexual Propagation and Transplantation Success of Cycas revoluta Plants

Mildenstein, T. and J. Boland. 2010. Development of Mariana fruit bat survey protocols for Mariana Island surveys, final report prepared for USFWS-Rota Island pilot surveys.

Mildenstein, T. E-mail to Coralie Cobb

Morrison, Douglas W. "Foraging and day-roosting dynamics of canopy fruit bats in Panama." *Journal of Mammalogy* 61.1 (1980): 20-29.

Müller, Brigitte., Steven M. Goodman & Leo Peichl. 2007. Cone photoreceptor diversity in the retinas of fruit bats (Megachiroptera). Brain, Behavior and Evolution 70: 90-104.

Murugavel, B., S. Kandula, H. Somanathan, and A. Kelber. 2023. Home ranges, directionality and the influence of moon phases on the movement ecology of Indian flying fox males in southern India. *Biology Open,* 12(2), bio059513.

National Oceanic and Atmospheric Administration. 2023. Available at: https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines/guidelines-&-distances. Accessed August 14, 2023.

NAVFAC Marianas. 2013. Threatened and Endangered Species and Migratory Birds Monitoring Report, Naval Support Activity Andersen, Guam. Prepared by HDR Inc., San Diego, CA. February.

NAVFAC Marianas. 2014. Federal Candidate Species Surveys on Guam. Prepared by Daniel P. Lindstrom, Ph.D. & John C. Benedict, Ph.D. January.

NAVFAC Marianas and AAFB. 2015. Monitoring Mariana Fruit Bats on AFB 2015. Prepared by T. Mildenstein and R. Miller, Biology Program, UOG. July.

NAVFAC Pacific. 2013. Final Report: Biological Surveys – Reports 1&2, Various Locations on Guam in Support of the Guam and Commonwealth of the Northern Mariana Islands Military Relocation (2012 Roadmap Adjustments) Supplemental Environmental Impact Statement. Prepared by TEC-AECOM Joint Venture for Joint Guam Program Office, Honolulu, HI. April.

__. 2021. Final Work Plan for P-745 Surveys of Federally Listed Species at Guam National Wildlife Refuge. Contract N62742-18-D-1802, Task Order N6274221F0187. November.

Ngiratregd, K & G.C. Fiedler. 2016. Assessing Distribution and Population of Partulid Snails at the Ritidian Guam National Wildlife Refuge, Report for Directed Research Project, University of Guam Biology Program.

Pepper, C.B., M.A. Nascarella, and R.J. Kendall. 2003. A review of the effects of aircraft noise on wildlife and humans, current control mechanisms, and the need for further study. Environmental Management 32: 418-432.

Piniak, W.E.D., D.A. Mann, C.A. Harms, T.T. Jones, and S.A. Eckert. 2016. Hearing in the Juvenile Green Sea Turtle (Chelonia mydas): A Comparison of Underwater and Aerial Hearing Using Auditory Evoked Potentials. *PLoS ONE* 11(10): e0159711.doi:10.1371/journal.pone.0159711.

Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, and M.B. Halvorsen. 2014. ASA S3/SC1. 4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report Prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI: Springer.

Queensland Government, Department of Primary Industries and Fisheries. Flying fox control methods research findings. https://www.daf.qld.gov.au/__data/assets/pdf_file/0006/71970/Flying-fox- controlmethods-research.pdf. 2023.

Raulerson, L. and A. Rinehart. 1991. Trees and Shrubs of the Mariana Islands. University of Guam Press, Mangilao, Guam. 120p.

Rubinoff, D. and B. Holland. 2018. The Conservation Status of Two Endangered Mariana Butterflies, Hypolimnas octocula marianensis and Vagrans egistina (Nymphalidae). *The Journal of the Lepidopterists' Society*, 72(3), 218-226.

Safi, K. 2008, Social Bats: The Males' Perspective. Journal of Mammalogy. Pp. 1342-1350,

Scheuerman, C. and C. Camacho. 2022. Final Survey Report for P-745 Surveys of Federally Listed Species at Guam National Wildlife Refuge, Guam. Prepared by Cardno GS for NAVFAC Pacific under Contract N62742-18-D-1802, Task Order N6274221F0187. March.

Schneider, D., et.al. Cycads: their evolution, toxins, herbivores and insect pollinators. July 2002.

Schreiner, I.H. and D.M. Nafus. 1996. Survey of rare butterflies in the Mariana Islands. Preliminary report to USFWS. Unpublished report.

Smith, B.D. 2008. Seven Decades of Disruption, Decline, and Extinction of Land Snails in Aguiguan,

Mariana Islands. Report to the Division of Fish and Wildlife Commonwealth of the Northern Mariana Islands Saipan, CNMI. University of Guam Marine Laboratory Miscellaneous Report 11

SWCA. 2012. Final summary report; Noise study and demographic survey of Mariana fruit bats and Mariana crows, Anderson Air Force Base, Guam. Prepared by SWCA. May 11, 2012.

Stone, B.C. 1970. The Flora of Guam. A Manual for the Identification of the Vascular Plants of the Island.

Tarnovsky, Y., et.al. 2023. Bats experience age-related hearing loss (presbycusis).

Terry, I. et. al., 2009. Cone insects and putative pollen vectors of the endangered cycad, ***Cycas micronesica*****. Micronesica.**

USFWS. 2004. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Mariana Fruit Bat and Guam Micronesian Kingfisher on Guam and the Mariana Crow on Guam and in the Commonwealth of the Northern Mariana Islands; Final Rule. 2004. 69 Fed. Reg. 208 (October 28, 2004) (to be codified at 50 C.F.R. part 17).

__. 2009. Guam National Wildlife Refuge Comprehensive Conservation Plan. Region 1, Portland, OR. September.

__. 2012. 5-YEAR REVIEW Short Form Summary Species Reviewed: Pteropus mariannus mariannus (Mariana fruit bat) Current Classification: Threatened

__. 2014a. GIS Data for Species Proposed for Listing on Guam. Pacific Islands Fish and Wildlife Office,
Honolulu, HI.

__. 2014b. Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for 21 Species and Proposed Threatened Status for 2 Species in Guam and the Commonwealth of the Northern Mariana Islands; Proposed Rule. 2014. 79 Fed. Reg. 59363 (October 01, 2014) (to be codified at 50 C.F.R. part 17).

__. 2017. Marine Relocation Final Biological Opinion. Reinitiation of the 2015 Biological Opinion on the Department of the Navy's Relocation of U.S. Marine Corps from Okinawa to Guam and Associated Activities on Guam. July 18.

__. 2020a. 5-Year Review, Summary and Evaluation of Humped Tree Snail (*Partula gibba*). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020b. 5-Year Review, Summary and Evaluation of Fragile Tree Snail (*Samoana fragilis*). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020c. 5-Year Review, Summary and Evaluation of Guam Tree Snail (*Partula radiolata*). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020d. 5-Year Review, Summary and Evaluation of Mariana eight-spot butterfly (*Hypolimnas octocula marianensis*). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020e. 5-Year Review, Summary and Evaluation of *Dendrobium guamense* (no common name). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020e. 5-Year Review, Summary and Evaluation of *Serianthes nelsonii* (Hayun lagu). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020g. 5-Year Review, Summary and Evaluation of *Tabernaemontana rotensis* (no common name). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020h. 5-Year Review, Summary and Evaluation of *Corvus kubaryi* (Mariana crow; åga). Pacific Islands Fish and Wildlife Office, Honolulu, HI, HI.

__. 2020i. 5-Year Review, Summary and Evaluation of *Halcyon cinnamomina cinnamomina* (Sihek, Guam Micronesian kingfisher). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2022. Environmental Conservation Online System (ECOS). Available at: https://ecos.fws.gov/ecp/. Accessed February 17, 2022.

U.S. Fish and Wildlife Service. 2023. Ritidian: Road to Recovery | U.S. Fish & Wildlife Service (fws.gov).

U.S. Forest Service. 2006. Guam Vegetation Mapping. 3rd Edition. Pacific Southwest Region, Forest Health Protection, McClellan, CA. October.

U.S. Navy. 2022. Monitoring Mariana fruit bats on Andersen Air Force Base, 2021. Prepared for NAVFAC Marianas, Guam. Prepared by Tammy Mildenstein, University of Guam, under Cooperative Agreement Number N40192-15-2-8001

University of Guam. 2014. Final Project Report - Federal Candidate Species Surveys on Guam. Prepared for NAVFAC Marianas, Guam. January.

__. 2022. Andy South Final Report. Prepared for NAVFAC Marianas, Guam. March.

Valdez, E.W., 2010. Population Assessment of the Mariana Fruit Bat (*Pteropus mariannus mariannus*) on Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Asuncion, and Maug; 15 June – 10 July 2010.

Vogt, S. 2023. Personal communication.

Wiles, G.J. 1987. The Status of Fruit Bats on Guam. *Pacific Science* 41:1-4.

Witherington, B.E. and K.A. Bjorndal. 1991. Influences of wavelength and intensity on hatchling sea turtle phototaxis: implications for sea-finding behavior. *Copeia*, pp.1060-1069.

This page intentionally left blank.

APPENDIX A

Memorandum of Agreement between the Department of the Interior and the Department of the Navy for Management of the Ritidian Unit of the Guam National Wildlife Refuge, The U.S. Geological Survey Brown Treesnake Research and Rapid Response Facilities, and Operation of Overlapping Surface Danger Zones

This page intentionally left blank.

MEMORANDUM OF AGREEMENT
BETWEEN
THE DEPARTMENT OF THE INTERIOR
AND
THE DEPARTMENT OF THE NAVY
FOR
MANAGEMENT OF THE RITIDIAN UNIT OF THE GUAM NATIONAL WILDLIFE REFUGE, THE U.S. GEOLOGICAL SURVEY BROWN TREESNAKE RESEARCH AND RAPID RESPONSE FACILITIES, AND OPERATION OF OVERLAPPING SURFACE DANGER ZONES

I. PURPOSE

The Department of the Interior (DOI), through authorities delegated from the Secretary to the Director of the U. S. Fish and Wildlife Service (FWS) and the Director of the U. S. Geological Survey (USGS), enters into this Memorandum of Agreement (MOA) with the Department of the Navy (DON) (jointly, DOI and DON are the Parties), to document the commitments, both individual and collective, of the Parties providing for the establishment and operation of surface danger zones (SDZ) which overlay a portion of the Ritidian Unit of the Guam National Wildlife Refuge (GNWR) and the USGS Brown Treesnake Research and Rapid Response (BTS RRR) facilities.

II. AUTHORITY

This MOA is hereby made and entered into by and between the Parties under the authority of section 2822 (*Establishment of Surface Danger Zone, Ritidian Unit, Guam National Wildlife Refuge*) of the National Defense Authorization Act for Fiscal Year 2015, Public Law 113-291 (hereinafter "FY15 NDAA"), and in accordance with the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd) and the Cooperative Agreements between the U.S. Navy, the U.S. Air Force, and the U.S. Fish and Wildlife Service (USFWS) for the establishment and management of the Guam National Wildlife Refuge, Guam. This MOA is additionally made and entered into by and between the Parties under the authority of section 316 (*Comprehensive Program for the Eradication of the Brown Treesnake Population from Military Facilities in Guam*) of the National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417 ("FY09 NDAA").

III. OBJECTIVES

The objectives of this MOA are to accommodate:

A. The operation of a live-fire training range complex (LFTRC) on Andersen Air Force Base-Northwest Field; and

B. The on-going management of the adjacent GNWR Ritidian Unit by the USFWS.

C. The on-going operation of the USGS BTS RRR facilities.

IV. ACKNOWLEDGEMENTS AND BACKGROUND

The Parties acknowledge that:

A. Section 2822 of the FY15 NDAA provides that this MOA shall include measures to maintain the purposes of the Ritidian Unit. The NDAA states:

(a) Agreement to Establish -- "In order to accommodate the operation of a live-fire training range complex on Anderson Air Force Base-Northwest Field and the management of the Ritidian Unit of the Guam National Wildlife Refuge, the Secretary of the Navy and the Secretary of the Interior, notwithstanding the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd et seq.), may enter into an agreement providing for the establishment and operation of a surface danger zone which overlays the Ritidian Unit or such portion thereof as the Secretaries consider necessary."

(b) Elements of Agreement – The agreement to establish a surface danger zone over all or a portion of the Ritidian Unit of the Guam National Wildlife Refuge shall include --

(1) "measures to maintain the purposes of the Refuge; and"
(2) "as appropriate, measures, funded by the Secretary of the Navy from funds appropriated after the date of enactment of this Act and otherwise available to the Secretary, for the following purposes:"
(A) "Relocation and reconstruction of structures and facilities of the Refuge in existence as of the date of the enactment of this Act."
(B) "Mitigation of impacts to wildlife species present on the Refuge or to be reintroduced in the future in accordance with applicable laws"
(C) "Use of Department of Defense personnel to undertake conservation activities within the Ritidian Unit normally performed by Department of the Interior personnel, including habitat maintenance, maintaining the boundary fence, and conducting the brown tree snake eradication program."
(D) "Openings and closures of the surface danger zone to the public as may be necessary."

B. The GNWR Comprehensive Conservation Plan (CCP) sets forth the following purposes for which the GNWR Ritidian Unit was established (excerpts only):

1. ". . . to conserve (A) fish or wildlife which are listed as endangered species or threatened species . . . or (B) plants . . ." 16 U.S.C. § 1534 (Endangered Species Act of 1973).

2. ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . ." 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956).

3. ". . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" 16 U.S.C. § 715d (Migratory Bird Conservation Act).

4. ". . . suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resource, (3) the conservation of endangered species or threatened species . . ." 16 U.S.C. § 460k-1 (Refuge Recreation Act).

C. The Parties share common goals for the recovery of endangered and threatened species, the protection of native flora and fauna, the conservation of unique ecosystems, and the maintenance of native biological diversity on Guam.

D. The GNWR Ritidian Unit consists of 1218 acres (385 acres of land and 833 acres of submerged land) under the custody and control of the USFWS. The DON reported these lands as excessed to the General Services Administration (GSA) on October 9, 1992, for the express purpose of establishing a National Wildlife Refuge at Ritidian Point. The GSA transferred the land to DOI on July 6, 1993, and the submerged land to DOI on May 17, 1996. The transfer documents refer to 772.1 acres (370.6 acres of land and 401.5 acres of submerged land). However, sonar surveys by NOAA have resulted in a more accurate location of the 30-meter isobath, which is the seaward boundary of the submerged lands. USFWS land records are being updated to reflect this better estimate of the Ritidian Unit acreage.

E. The U.S. Fish and Wildlife Service completed a CCP and Environmental Assessment for the Guam NWR on September 30, 2009. The CCP is intended to guide the management of the Refuge for 15 years.

F. On April 27, 2012, the U.S.-Japan Security Consultative Committee (SCC) issued a joint statement announcing its decision to adjust the plans outlined in the May 2006 Realignment Roadmap for the relocation of U.S. Marines to Guam. In accordance with the SCC's adjustments, the DoD adopted a new force posture in the Pacific providing for a materially smaller force on Guam. Specifically, the adjustments include reducing the originally planned relocation to Guam of approximately 8,600 Marines and 9,000 dependents to a force of approximately 5,000 Marines and approximately 1,300 dependents.

G. On August 28, 2015, following preparation of an Environmental Impact Statement, the DON issued a Record of Decision selecting Andersen Air Force Base-Northwest Field as the location for an LFTRC. The LFTRC will ensure the relocating U.S. Marines are organized, trained, and equipped consistent with 10 U.S.C § 5063, satisfy individual live-fire training requirements, and enable the U.S. Government to establish an operational U.S. Marine Corps presence in Guam in accordance with April 27, 2012 Joint Statement of the U.S.-Japan SCC.

H. LFTRC SDZs will overlay a portion of the GNWR Ritidian Unit. The SDZs are required by Marine Corps Order 3570.1C to ensure the safe operation of the LFTRC at Andersen Air Force Base-Northwest Field. The SDZ for the multi-purpose machine gun range (MPMG) (the largest and westernmost LFTRC range) overlays the access road to the GNWR Ritidian Unit and existing GNWR facilities used by USFWS and USGS staff. The SDZ overlapping facilities would include GNWR Ritidian Point Visitor Center, USFWS and USGS offices, laboratories and maintenance facilities, USGS animal holding facilities and outdoor animal testing enclosures.

I. The Marine Corps estimates the LFTRC will be used up to 39 weeks/year and cannot provide any additional scheduling information and timelines until the ranges become operational.

J. USFWS and USGS have noted they would be unable to meet the purposes of the GNWR Ritidian Unit and conduct the USGS BTS RRR without:

   a. The replacement of facility requirements at the GNWR Ritidian Unit to a location within the Refuge that is not within the SDZs, and;
   b. DON permanently providing funding for USFWS personnel requirements to account for the additional costs, such as staff inefficiencies, consistent with NDAA 2822(b)(2) caused by the operation of the SDZs.

V. COMMITMENTS OF THE PARTIES

A. The Parties together agree:

1. To identify range scheduling Points of Contact (POCs) who will coordinate USFWS, USGS, DON and public access to the GNWR Ritidian Unit; and
2. To carry out the roles and responsibilities assigned to them in this MOA.
3. To compensate for the additional burden driven by operation of the LFTRC and associated SDZs, DON will provide funding to DOI to hire employees and to offset additional costs to manage the GNWR occasioned by operation of the SDZs. The DON and DOI will identify and mutually agree on these costs caused by the DON operation of the LFTRC, and the associated number and role of the employees to be funded by DON. Initially, the DON agrees to provide funding up to $150,000 in FY22 and up to $350,000 in FY23 to cover the cost of hiring full time equivalents (FTEs) to address the additional costs caused by the operation of the first four LFTRC ranges. Thereafter, on an annual basis, the DON and DOI will review the costs associated with the operation of the LFTRC at the annual formal range scheduling review (see Section VI below). The review will take into account the extent to which the USFWS is staffed to meet baseline GNWR CCP requirements. The review will be used to make adjustments, if required and mutually agreed upon by the parties, to funding, functions, and processes established in this MOA. The parties envision initial FTEs will focus on range scheduling and law enforcement, with subsequent FTEs focused on scientific or biological functions.

B. The DOI will:

1. Retain responsibility for the continued operation and management of the GNWR Ritidian Unit;
2. Continue management activities to meet the purposes for which the GNWR Ritidian Unit was established and to meet the 10 goals outlined in the CCP;
3. Continue operation of the USGS BTS RRR on Guam;
4. Provide DON access to the GNWR Ritidian Unit to install and maintain signage at the boundary of the SDZs and conduct any other activities required as part of this MOA;
5. Participate in weekly, quarterly and annual range scheduling meetings hosted by the DON, review and verify quarterly published range schedules, and be responsible for requesting any modifications to the range schedule through the Marine Corps Range Control Office (RCO). The DON-funded USFWS Range Scheduling POC will:
    a. Acquire a Range Facility Management Support System (RFMSS) account from the DON, and receive training and maintain proficiency on the use of the account;

b. Provide timely requests for access to the SDZ-encumbered portion of the GNWR Ritidian Unit to the DON;
c. Provide timely cancellations of requested access if it is no longer needed to the DON in order to provide opportunity for DON to reschedule use of the range; and
d. Coordinate with and represent USGS staff from the USGS BTS RRR efforts within the SDZ encumbered portion of the GNWR Ritidian Unit relative to DON training;

6. Collaborate and support DON efforts to identify, analyze, and implement alternative access to the GNWR Ritidian Unit recreational areas outside the SDZs to support continued public use and minimize access impacts;
7. Provide public access to beaches, trails, and cultural properties during normal business hours consistent with the CCP and when the LFTRC is not being used and when the USFWS does not otherwise close the GNWR Ritidian Unit for reasons related to its operations; and
8. Work collaboratively with the DON to complete all necessary consultations in a timely manner to support actions undertaken as a result of the establishment of the SDZs. These actions will include development of alternative beach access routes and construction of replacement administration and research facilities and a visitor center.

C. The DON will:

1. Manage all range operations associated with the LFTRC on Andersen Air Force Base-Northwest Field;
2. Be responsible for establishing and implementing all range safety regulations required by Marine Corps Order (MCO) 3550.10 (Policies and Procedures for Range and Training Area Management), which will include provisions for public closures of portions of the GNWR Ritidian Unit while the ranges are in use.
    a. Coordinate with DOI when situations arise in which it becomes necessary for DOI personnel to exercise their law enforcement authority within the GNWR Ritidian Unit in support of DON's use of the LFTRC.
    b. Supply, install, maintain, and replace signs and other SDZ barrier controls within the GNWR Ritidian Unit that are required to meet the range safety standards in MCO 3570.1C (Range Safety).
3. In accordance with MCO 3550.10, establish a range scheduling process. Specifically,
    a. Establish the training schedule for the LFTRC. The DON will work closely with DOI to accommodate access requests to the area encompassed by the SDZs prior to establishing the schedule;
    b. Host range scheduling meetings:
        i. Weekly meetings between the RCO and the designated DOI range scheduling POC to review the upcoming range schedule for the next three

(3) months. At this meeting, DOI access requests will be reviewed and expected LFTRC down-time identified;

11. Host quarterly range scheduling meetings;

m. Host an annual range scheduling meeting to produce a general use and access schedule and adjust range schedulilJ,g coordination processes as needed;

c. Allow the DOI range scheduling POC access to the daily operational range schedule via RFMSS; and

d. If last minute cancellations/changes in the training schedule occur and portions of the GNWR Ritidian Unit under the SDZs can be opened for access, the RCO will notify DOI range scheduling POC.

4. Endeavor to provide the maximum practicable access to the GNWR Ritidian Unit, consistent with the accomplishment of training requirements;
5. Provide the USGS BTS RRR 24/7 access to the 5-hectare Closed Population Facility on Northwest Field, located behind the range and outside the SDZs;
6. Build permanent replacement office, visitors' area, maintenance, research facilities, and any other facilities DON and DOI agree are commensurate with those impacted by the SD Zs. Construction of permanent facilities must be initiated one year prior to live fire training commencing on the MPMG. The exact scope of new facilities required will be determined based on a joint review of existing facility options as well as the required need.

    a. Prior to consturction and use of new facilities, DON will comply with all applicable laws and regulations, including the National Environmental Policy Act, Endangered Species Act, and the National Historic Preservation Act, among others;

    b. If permanent facilities are not completed when training on the MPMG commences, DON will provide adequate temporary facilities for the Refuge and BTS functions.

    c. In order to minimize adverse effects to designated critical habitat on the Refuge from construction of the new permanent facilities, DON will demolish the existing DOI facilities, remove demolition debris, and prepare the site for restoration and regeneration. Preparation of the site by the DON will consist of clearing and grading, delineation of the habitat area, and an initial planting of native vegetation including the translocation of native plants from the new facilities construction area or from DON nursery stock (if available). Once site preparation is complete, habitat management will be the responsibility of DOI. Both DON and DOI recognize that this conservation measure will be linked to the DON proposed action for construction of new permanent DOI facilities within the Refuge.

d. Upon completion, DON will transfer the permanent facilities to DOI via execution of a DD Form 1354, and have no further responsibility for these DOI facilities. Thereafter, DOI will assume full responsibility for the facilities, including utilities, maintenance and upkeep.

7. Identify and construct alternative access to the recreational portion of the GNWR Ritidian Unit outside the SDZs to support continued public use consistent with the purposes of the Refuge and the LFTRC.
   a. Prior to construction and implementation of the alternative access, DON will comply with all applicable laws and regulations as described above in C(6)(a).
   b. DOI agrees to make available Refuge land at no cost to DON and facilitate approvals consistent with C(6)(a) in the siting and construction of the alternative access.

VI. REVIEW AND EVALUATION

The Marine Corps RCO and the designated DOI range scheduling POC will maintain open and continuous communication, including weekly, quarterly, and annual range scheduling meetings, as described under C(3)(b). As part of the annual range scheduling meeting, the DON and DOI will review the functionality and efficiency of the processes set forth in this MOA. The Parties will use these meetings to identify any problems and make appropriate adjustments. This may include adjustments to scheduling procedures, DON funded DOI positions and inefficiencies, and funding amount.

VII. DISPUTE RESOLUTION

A. The Parties shall make every effort to resolve any disagreements in carrying out actions under this MOA through staff-to-staff coordination, discussions, and information-sharing. The Parties shall attempt to resolve any disputes requiring action at the staff level as quickly and effectively as possible. If the Parties and their immediate supervisors are unable to resolve an issue, in a timeframe and manner necessitated by the dispute, the Parties commit to the following protocol for resolving the dispute at the lowest level possible. Use of this protocol includes instances where a Party believes there is a default in the obligations owed pursuant to this MOA by the other Party.

   1. Local Level Resolution Group: If a disputed issue cannot be resolved by the Parties' Primary POCs, the highest-ranking DON, FWS, and USGS official on Guam, with authority over the issues subject to the dispute, will attempt to find resolution to the dispute at the local level.

   2. Regional Level Resolution Group: If a resolution at the local level is unsuccessful, the issue will be elevated to either the Chief of Naval Operations

(appropriate designation) if a Navy Issue, or Headquarters Marine Corps (Installation & Logistics) if a Marine Corps issue, and to the Regional Directors of FWS and USGS or their designee.

3. National Level Resolution Group: If a resolution at the regional level is unsuccessful, the issue will be elevated to the National Level Resolution Group, comprised of, at a minimum, a representative from the DON Secretariat, the FWS Director or his/her designee, and the USGS Director or his/her designee, for final resolution.

B. The Parties agree the use of this Resolution Group process, as established in Section VII. A. of this MOA, is to ensure all disputes arising under this MOA are resolved in a timely manner. All requests for a dispute resolution at any level should include:

1. A concise summary of the issues in dispute and decisions that need to be made;

2. A statement of each of the Parties' position on each disputed issue;

3. All appropriate supporting rationale and documentation necessary for reaching a decision, including a copy of the MOA with provisions relevant to the dispute highlighted; and

4. A brief chronology of any actions already taken to resolve the dispute.

C. Resolution of disputes should be pursued as quickly as possible, and elevated to the next level as soon as it becomes apparent that the dispute will not be resolved at the level then reviewing the dispute. In no event should a review level take more than 30 days seeking to reach resolution of a dispute.

VIII. MODIFICATIONS, INTERPRETATIONS, ENFORCEABILITY AND TERMINATION

A. Changes, modifications and/or amendments to this MOA may be made at any time upon mutual written consent of the Parties. With regard to the Parties, no oral statement by any person and no written statement by anyone other than the undersigned, or an authorized representative as designated in writing, shall be interpreted as modifying or otherwise affecting the terms of this MOA.

B. This MOA is not intended to nullify or supersede any existing agreement between or among the Parties. Agreements that have been previously executed for DOD and DOI actions on the Ritidian Unit on the island of Guam shall continue to apply for the circumstances for which they were developed.

C. The Parties agree this MOA is limited to the authority set forth in section 2822 of the FY15 NDAA, does not expand or alter the scope of the Parties' respective authorities, and shall not be construed to create any legal obligation on the part of either agency or any private right or cause of action for or by any person or entity.

D. Performance under this MOA by the Parties is dependent upon lawful appropriation, availability, and allocation of funds by proper authorities. Nothing herein shall constitute nor be considered to constitute an obligation or expenditure of funds in advance of or in excess of a proper appropriation by Congress of the United States or otherwise be in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341 et seq.

E. Except as otherwise required by law, any documents or data exchanged between the Parties will not be released to a third party unless the designated representative of the Party that generated the document or data approves the release. The Parties agree to consult with each other prior to the release of any such documents or data pursuant to such lawful authority, or refer such documents and data to the appropriate Party for the release determination if permitted under the relevant legal authority.

F. Termination of the MOA

1. The MOA can only be terminated by mutual agreement of the Parties.

IX. SIGNATORIES

_____ Date: 5/14/2020
Director, U.S. Fish and Wildlife Service
Department of the Interior

_____ Date: _____
Director, U.S. Geological Survey
Department of the Interior

_____ Date: _____
Deputy Assistant Secretary of the Navy (Environment)
Department of the Navy

C. The Parties agree this MOA is limited to the authority set forth in section 2822 of the FY15 NDAA, does not expand or alter the scope of the Parties' respective authorities, and shall not be construed to create any legal obligation on the part of either agency or any private right or cause of action for or by any person or entity.

D. Performance under this MOA by the Parties is dependent upon lawful appropriation, availability, and allocation of funds by proper authorities. Nothing herein shall constitute nor be considered to constitute an obligation or expenditure of funds in advance of or in excess of a proper appropriation by Congress of the United States or otherwise be in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341 et seq.

E. Except as otherwise required by law, any documents or data exchanged between the Parties will not be released to a third party unless the designated representative of the Party that generated the document or data approves the release. The Parties agree to consult with each other prior to the release of any such documents or data pursuant to such lawful authority, or refer such documents and data to the appropriate Party for the release determination if permitted under the relevant legal authority.

F. Termination of the MOA

1. The MOA can only be terminated by mutual agreement of the Parties.

IX. SIGNATORIES

_____ Date: _____
Director, U.S. Fish and Wildlife Service
Department of the Interior

_____ Date: 14 MAY 20
Director, U.S. Geological Survey
Department of the Interior

_____ Date: _____
Deputy Assistant Secretary of the Navy (Environment)
Department of the Navy

C. The Parties agree this MOA is limited to the authority set forth in section 2822 of the FY15 NDAA, does not expand or alter the scope of the Parties' respective authorities, and shall not be construed to create any legal obligation on the part of either agency or any private right or cause of action for or by any person or entity.

D. Performance under this MOA by the Parties is dependent upon lawful appropriation, availability, and allocation of funds by proper authorities. Nothing herein shall constitute nor be considered to constitute an obligation or expenditure of funds in advance of or in excess of a proper appropriation by Congress of the United States or otherwise be in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341 et seq.

E. Except as otherwise required by law, any documents or data exchanged between the Parties will not be released to a third party unless the designated representative of the Party that generated the document or data approves the release. The Parties agree to consult with each other prior to the release of any such documents or data pursuant to such lawful authority, or refer such documents and data to the appropriate Party for the release determination if permitted under the relevant legal authority.

F. Termination of the MOA

1. The MOA can only be terminated by mutual agreement of the Parties.

IX. SIGNATORIES

_____ Date: _____
Director, U.S. Fish and Wildlife Service
Department of the Interior

_____ Date: _____
Director, U.S. Geological Survey
Department of the Interior

_____ Date: 5/14/2020
Deputy Assistant Secretary of the Navy (Environment)
Department of the Navy

APPENDIX B

Health Assessment Criteria Worksheet

This page intentionally left blank.

ASSESSMENT CRITERIA

Parent ID no.	Date collected (YYYYMMDD)	Collected by (First, Last Name)	Collection Location	UTM N	UTM E	Salvage type: Specify if Pup	Salvage type: Specify if Stem	Salvage type: Specify if Seed	[1]ASSESSMENT SCORE 1: [6 points for each pest or condition present] Specify pest presence: LB, non-calloused stem rot, ungulate damage (fresh, deeper than 20% of stem dia.)

[1]ASSESSMENT SCORE 1 (Cycas):

LB - Longhorn beetle

Stem rot

Ungulate damage (fresh, deeper than 20% of stem diameter)

[2]ASSESSMENT SCORE 2 (Cycas):

T - Termite

Healed cavities (calloused)

[3]ASSESSMENT SCORE 3 (Cycas):

Healed cavities (calloused)

Termites

*LEGEND

CS - Cycad scale

ND - Nutrient deficiencies

F - Frass

LM - Leaf miner

LP - *Luthrodes pandava*

OP - Other Pest, specify

S - Sap

[2]ASSESSMENT SCORE 2: [0 for Y, 3 for N] full crown of green leaves present (Y/N)	[3]ASSESSMENT SCORE 3: [1 point for each condition present] Specify pest presence: termites, healed cavities (calloused)	Total Score for each Cycas using assessment score 1, 2 and 3: Salvagable (<6) Unsalvagable (=>6)	*Specify: CS, ND, F, LM, LP, OP, S	Epiphyte present: (Y/N)	Stem count	Pup count	Height	Notes

APPENDIX C

Cycad Conservation Framework

This page intentionally left blank.

APPENDIX C: Cycad Conservation Framework

Survey, Transplant and Monitoring Years	Project Year		Baseline - Number of cycads expected to persist in the proposed development area in the absence of the proposed action: XX genetically distinct cycads in project footprint (initial survey year).*	Cycad Conservation to Maintain the Baseline: Two alternatives to maintain the baseline so the number of plants in the wild in 20 years is not reduced as a result of the proposed action. **	
				Long-Term Field Maintenance: ongoing control of cycad scale, field maintenance of outplanted cycads to meet short- and long-term targets anticipated to be needed to maintain the baseline over the 20-year period. With the long-term maintenance, annual mortality is expected to be 2.9%. ***	No long-term field maintenance would be done, beyond the initial 18 months. WIthout the long-term maintenance, annual mortality is expected to be 5.8%. ***
Year of initial survey (baseline)	2021		69		
	2022		65		
	2023		61		
	2024		58		
	2025		54		
	2026		51		
Year 1 - Transplanted into conservation area	2027	1	48	48	48
	2028	2	45	47	45
	2029	3	43	45	43
	2030	4	40	44	40
Year 5	2031	5	38	43	38
	2032	6	36	41	36
	2033	7	34	40	34
	2034	8	32	39	32
	2035	9	30	38	30
Year 10	2036	10	28	37	28
	2037	11	27	36	26
	2038	12	25	35	25
	2039	13	24	34	23
	2040	14	22	33	22
Year 15	2041	15	21	32	21
	2042	16	20	31	20
	2043	17	19	30	18
	2044	18	17	29	17
	2045	19	16	28	16
Year 20 - Minimum number of plants necessary to ensure maintenance of the baseline population.	2046	20	15	27	15

* In 2002, the Forest Inventory and Analysis Program estimated the Guam island-wide cycad population using 46 permanent field plots serving as a baseline. In 2012, cycad populations were re-monitored to detect change since 2002. In the 10 years between field studies, the population estimate decreased from 1,571,556 to 624,000 individuals (range including sampling error: 382,000-866,000) (Donnegan et al. 2004; Lazaro et al. 2013). This represents an average annual rate of decline of 8.1% (5.8%-13.2%). By applying this rate of decline to the 2012 estimate of cycads, there are approximately 344,000 (123,000-538,000) cycads on Guam in 2020.

** The "Year 1 - Transplant" number of Cycas micronesica is based off the number of salvagable plants occurring within the project footprint (including impacted edge plants within 10-feet of the project footprint) that are removed/impacted.

*** This number reflects the number that survive (transplanted/conserved) or occur from additional augmentation at an off-site conservation area. Additional propagation and outplanting would be conducted, if needed, to ensure year 5, 10, 15, and 20 benchmark number of plants (highlighted below) are met or exceeded.

This page intentionally left blank.

APPENDIX D

Guam National Wildlife Refuge (GNWR) Facilities Relocation:

Minimizing Impacts to Critical Habitat

This page intentionally left blank.

Guam National Wildlife Refuge (GNWR) Facilities Relocation: Minimizing Impacts to Critical Habitat

The approach for minimizing impacts to critical habitat is multifaceted to account for a variety of factors. Overall, the aim is to increase function and conservation of critical habitat to support the recovery of fanihi, aga and sihek in the long term. Targeted plant species that provide foraging, nesting, roosting and breeding functions for the three species (Primary Constituent Elements, PCE) will be outplanted 1) across the entire GNWR and 2) within five netted areas. Restoration and enhancement will consider geographic requirements for species (remoteness as identified in the critical habitat listing), spatial variability in existing critical habitat quality, ungulate impacts, restrictions because of established surface danger zones and management ability. Currently, ungulates are not controlled on any part of GNWR and continue to degrade habitat. Five areas will be netted to exclude ungulates for conservation benefit (Figure 1). The management actions within the netted areas would vary based on current habitat quality, substrate and access. Each outplanting outside of the five netted areas will be protected from ungulates with smaller barriers.

Two areas on the eastern side of GNWR will be netted for a total of 4.7 acres protected from ungulates (filled in green on Fig 1). The larger area, 3.44 acres, will be to the furthest east within the small arms range SDZ and would therefore have the most limited access for management. The area is the least degraded on GNWR but would require removal of invasive plants and additional PCE species that support the recovery of aga, sihek and fanihi would be outplanted. This area would require the least active management aside from maintenance of the netting. Maintenance would be timed when the area is accessible due to the firing range. The smaller area, 1.26 acres, would be outside of the small arms SDZ but within the MPMG SDZ. This area may be lower quality habitat due to proximity to additional disturbance, but access will be greater since it is outside of the small arms range SDZ. Both areas are within an area restricted from the public, which is behind a fence and a locked GNWR gate, and would remain most protected from additional disturbance.

An area approximately 0.32 acres adjacent to the proposed new facilities and nursery along Urunao Rd. will also be netted for ungulate protection (filled in purple on Fig 1). However, this lower-quality habitat will require the most invasive plant removal and outplantings of PCE plants. Given the proximity to facilities, the public can be engaged in restoration and enhancement efforts as an educational opportunity. The netted area will be close to a road and outside of a locked GNWR gate so has a greater potential for human disturbance (i.e. net damage, debris, etc). The proximity to roads and people would reduce the likelihood that sihek, aga and fanihi would nest, breed or roost in the area; however, it may provide additional foraging opportunity. Enhancing habitat quality would also allow for more natural limestone forest regeneration across a larger area.

The current GNWR facilities are in an area not designated as critical habitat. However, these facilities will be demolished creating an opportunity for habitat restoration. The nature center and parking lot (0.4 acres) and the administration buildings and parking lot (1.7 acres) will be netted after infrastructure is demolished and fill is placed (filled in red on Fig 1). Native, early seral vegetation suitable for beach strand will initially be outplanted followed by PCE plants species, if suitable. These areas will be within the MPMG SDZ; therefore, restoration and management will only be possible when accessible.

Additional outplanting and invasive plant removal outside of netted/fenced areas

To enhance critical habitat quality across the Refuge, it is important to not solely focus on small patches protected (relative to the size of the refuge) from ungulates. We will also enhance critical habitat by increasing vegetation for foraging, breeding, roosting, nesting as well as the habitat complexity required for fanihi, aga, and sihek across the entire area. Of the PCE plant species, many will be outplanted in their respective appropriate habitats outside of netted areas. Each outplanting will be protected from ungulates with individuals barriers. Invasive plants will be removed within a buffer around each outplanting (see additional information below about ongoing GNWR work on invasive plant removal). This is not likely to initially enhance recruitment since ungulates are likely to damage any additional seedlings but with established mature trees that provide the PCE functions, the birds and bat may be able to use more of the Refuge critical habitat. GNWR will continue to work toward increasing ungulate control, creating additional exclusions or eradication to further support recruitment of native and PCE species.

Effectiveness Criteria

Success for outplanting is defined as 488 genetically unique individuals of 15 different native PCE species that fruit twice after outplanting (see attached spreadsheet for specific species and number outplanted). There is no time limit as many of these trees are long lived and if grown from seed (which is the intent to preserve genetic diversity) will take many years to fruit. If no seed is available after 2 years of collecting, we will collect cuttings. Any cutting will be rooted before being outplanted and success remains at fruiting twice after outplanting. We estimate that at least 650 PCE plant species will need to be outplanted to account for natural mortality or stochastic events in order to meet our success criteria. However, we will continue efforts until success is met.

Priority areas to outplant will be:

1. Largest netted area on eastern side
2. Smaller netted area on eastern side
3. Netted area next to proposed new building site
4. Distributed across the Refuge in un-netted areas but within suitable habitat
5. Demolished building sites

The PCEs outplanted in the areas described (see species highlighted in green on the attached spreadsheet) provide the following for each bird and bat species:

Meet fanihi CH needs: Roosting and foraging, including species that fruit during the season when fruit is limited on Guam (Mildenstein pers. Comm. 2024); remote, within 328ft of cliffline, limited exposure to human disturbance.

Meet aga CH needs: Foraging and breeding, including species that provide important understory and foraging for young (per aga experts); provides sufficient area for nesting at least 950ft from nearest road (there is no location on the Refuge that is at least 950 ft from any trail but the closest access to this netted area is only by ATV so would be limited) and 203ft from nearest forest edge (450ft).

Meet sihek CH needs: Nesting (300 individual trees of all 7 nesting species identified in CH listing will be outplanted); closed-canopy, well-developed understory vegetation of large trees, diverse structure to support foraging and contributes to a sufficient breeding and foraging area (25ac) for each territory.

The variety of PCE species being outplanted are a mix of early, mid and late seral plants. Each of these are important contributions to the diverse habitat structure to support all functions required by fanihi, age and sihek. Since the habitat condition will vary where outplantings are targeted, GNWR will consider the appropriate seral stage.

To maintain ecological function that may be lost from the totality of the proposed project, continued USFWS Refuge management requires the project to provide comparable ecosystem functions added at the Refuge. Identifying required elements of ecological function shall be determined by a working group comprised of local experts, especially aga, fanihi, sihek and restoration experts, informed by National Wildlife Refuge System protocols, and which is convened by the USFWS on Guam.

Other relevant GNWR activities:

Ungulate control

Although this is not part of the outplanting proposal to the Marine Corps, for awareness, GNWR will be coordinating with DAWR on ungulate control. The goal is to establish a depredation program with volunteers using archery and air rifle. GNWR also has pig traps and pig brigs set up to control pig populations; however, deer remain a problem and without surrounding fences, GNWR will continue to have ungulates entering the Refuge.

Additional Invasive plant removal

The majority of GNWR natural resources management projects address invasive species removal for both plants and animals. We have had continued funding from outside sources and do not have any indication that this support will stop. Invasive species removal can support the success of native, outplanted PCE species outside of netted areas.

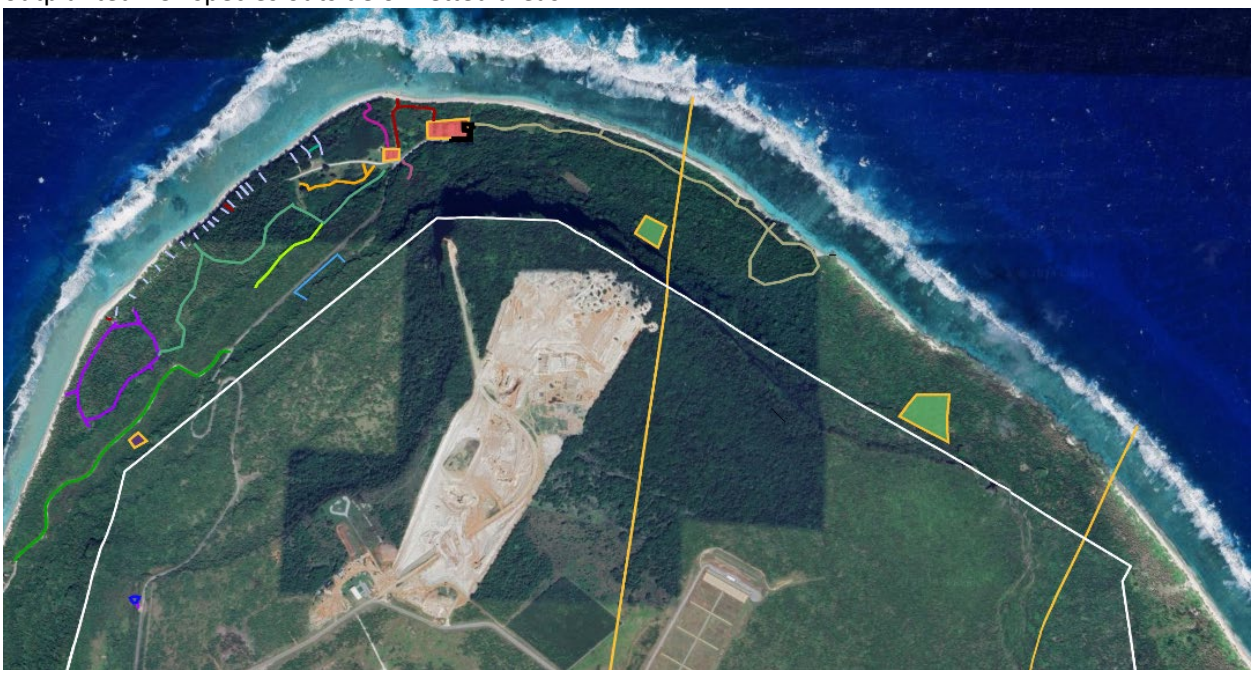


Fig 1: GNWR including boundary (white), trails (current and past) and approximate locations and sizes of proposed areas to net for ungulate exclusion. All netted areas are outlined in yellow and filled with different colors to reflect various levels of management.

This page intentionally left blank.

E.3 Biological Opinion

To Be Provided in the Final EA.

This page intentionally left blank.

Appendix F: Coastal Zone Management Act Coordination

To Be Provided in the Final EA.

This page intentionally left blank.

Appendix G: Cooperating Agencies Information

This page intentionally left blank.

UNITED STATES MARINE CORPS
MARINE CORPS INSTALLATIONS COMMAND
3000 MARINE CORPS PENTAGON
WASHINGTON DC 20350-3000

IN REPLY REFER TO:
12330
MCICOM SS
10 Feb 23

From: Todd Armsworth, Branch head, Defense Policy Review Initiative /Pacific Posture
To: Hugh Morrison
Regional Director
U.S. Fish & Wildlife Service
Pacific Region
911 NE 11th Ave.
Portland, Oregon 97232

SUBJECT: COOPERATING AGENCY FOR THE ENVIRONMENTAL ASSESSMENT (EA) FOR THE CONSTRUCTION OF FACILITIES AND ASSOCIATED INFRASTRUCTURE AT THE GUAM NATIONAL WILDLIFE REFUGE, RITIDIAN UNIT, GUAM

Enclosure (1): 14 May 2020 MOA

Dear Mr. Morrison,

The U.S. Marine Corps (USMC) is initiating the preparation of an Environmental Assessment (EA) for the proposed relocation of the United States Fish and Wildlife Service (USFWS) Facility (including United States Geological Survey (USGS) functions) in the Ritidian Unit of the Guam National Wildlife Refuge (GNWR). The Marine Corps requests formal participation by the USFWS as a cooperating agency in the preparation of the Refuge Facility Replacement EA, as prescribed in the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (NEPA), Title 40 Code of Federal Regulations (CFR) 1501.8. The USMC is requesting USFWS participation in the NEPA process based on USFWS management of Ritidian Unit, co-signatory of the enclosed Memorandum of Agreement (MOA), and special expertise with threatened and endangered (T&E) species and critical habitat present on the replacement facility site(s).

In 2015 the Department of the Navy (DON) signed a Record of Decision (ROD) to support Marine Corps relocation to Guam. As part of that action, LFTRC Surface Danger Zones (SDZ) will overlay a portion of the Ritidian Unit including the access road to the GNWR Ritidian Unit and existing GNWR facilities used by USFWS and USGS staff.

Section 2822 (*Establishment of Surface Danger Zone, Ritidian Unit, Guam National Wildlife Refuge*) of the National Defense Authorization Act for Fiscal Year 2015, Public Law 113-291 (hereinafter "FY15 NDAA"), provided for the establishment of an agreement between the USFWS and the Department of Defense (DoD) "in order to accommodate the operation of a live-fire training range complex on Andersen Air Force Base- Northwest Field and the management of the Ritidian Unit of the Guam National Wildlife Refuge", and "the establishment and operation of a surface danger zone which overlays the Ritidian Unit or such portion thereof." The FY15 NDAA also provided for the "relocation and reconstruction of structures and facilities of the Refuge in existence as of the date of the Act."

In May 2020, DON, USGS and USFWS entered into a MOA to accommodate establishment of the SDZ (Enclosure (1)). In that MOA the DON made several commitments including building USFWS/USGS replacement facilities, demolishing existing facilities, conducting an initial planting of native vegetation on the existing site, and transferring the replacement facilities to DOI.

As the lead agency, the USMC will prepare the Refuge Replacement Facility EA and will be responsible for scoping, developing, and managing the EA process. USMC will also work with the USFWS to evaluate potential action alternatives and environmental impacts to T&E Species and critical habitat.

As a cooperating agency, the USMC requests the following USFWS support:

- Designation of a representative to serve on the Refuge Replacement Facility EA Interdisciplinary Project Team (IPT);
- Providing information on replacement facility and operation requirements, preferred and potential alternative sites, and existing natural and cultural resources surveys of the GNWR Ritidian Unit;
- Providing timely comments throughout the EA process, to include making staff support available to enhance EA interdisciplinary analysis and review;
- Providing response to USMC requests for information within 21 days of receipt;
- Identifying a primary POC for all reviews, planning, design, and construction related to the relocation of the USFWS facilities;
- Participating, as necessary, in meetings hosted by the USMC; and

2

- Participating in and representing USFWS mission in the public involvement process.

We understand that USFWS participation as a Cooperating Agency under NEPA does not affect the agency's responsibilities under the ESA Section 7 process.

We look forward to continuing our partnership with the USFWS on this longstanding matter. Should you have any questions regarding this request, please contact Jacque Rice, Natural Resources Program Lead, Headquarters, U.S. Marine Corps at 571-256-2796.

Sincerely,

ARMSWORTH.TODD.ADKINS.1131338429

Digitally signed by ARMSWORTH.TODD.ADKINS.1131338429
Date: 2023.02.10 14:19:45 -05'00'

Copy to:
DASN (E&MR)
DASN (IF&E) Pacific Programs Office
MARFORPAC
Joint Region Marianas
MCB CAMP BLAZ
U.S. Fish and Wildlife Service, Pacific Island Field Office (Attn: Earl Campbell, Field Supervisor, Ecological Services)
U.S. Fish and Wildlife Service, Region 1 (Attn: Ricardo Lopez, Pacific Islands Refuges and Monuments Administrator, National Wildlife Refuge System)
U.S. Geological Survey (Attn: Bob Reed, Deputy Center Director, Pacific Island Ecosystems Research Center)

3

United States Department of the Interior

FISH AND WILDLIFE SERVICE
911 NE 11th Avenue
Portland, Oregon 97232-4181

In Reply Refer to:
FWS/R1/NWRS

June 18, 2024

Mr. Todd Armsworth
Branch Head, Defense Policy Review Initiative/Pacific Posture (DPRI/PP)
United States Marine Corps Marine Corps Installations Command
3000 Marine Corps Pentagon
Washington, DC 20350-3000

Dear Mr. Armsworth:

Thank you for your letter requesting our participation as a cooperating agency on the Environmental Assessment for the U.S. Marine Corps proposed relocation of the Guam National Wildlife Refuge, Ritidian Unit visitor services and maintenance facilities. We look forward to working with you as the Marine Corps develops the EA, pursuant to the Council on Environmental Quality's National Environmental Policy Act regulations for Cooperating Agencies. At the completion of the NEPA process, we plan to adopt the EA in support of our determinations associated with this proposed action.

To assure mutual understanding and facilitate communication during the NEPA process, we propose that our agencies work together to document our respective roles and responsibilities. We enclose a draft roles and responsibilities document for your consideration and welcome your thoughts.

If you have any questions or wish to discuss our partnership in completing the EA, please do not hesitate to reach out to Toni Mizerek, Project Leader at the Guam National Wildlife Refuge Complex. She can be reached at (671) 687-4203, or at toni_mizerek@fws.gov.

Sincerely,

Acting
Bridget Fahey

Digitally signed by BRIDGET FAHEY
Date: 2024.06.18 12:56:17 -07'00'

Regional Director

Enclosure:
Interagency Coordination Roles and Responsibilities for EA Preparation

Cc: Jacque Rice, HQ Marine Corps Natural Resources Program Lead

PACIFIC REGION 1

IDAHO, OREGON*, WASHINGTON,
AMERICAN SAMOA, GUAM, HAWAII, NORTHERN MARIANA ISLANDS
*PARTIAL

Proposed Interagency Coordination Roles and Responsibilities for the U.S. Marine Corps and the U.S. Fish and Wildlife Service for Guam NWR Ritidian Unit Facilities Relocation and Management Environmental Assessment.

BACKGROUND

This attachment outlines the lead (U.S. Marine Corps) and cooperating agency (U.S. Fish and Wildlife Service) roles and responsibilities for the development of a draft and final EA for the proposed relocation of the Guam National Wildlife Refuge Ritidian unit visitor services and maintenance facilities, and associated management of visitor access.

LEAD AGENCY RESPONSIBILITIES (U.S. Marine Corps)

A. USMC will have primary responsibility for meeting the requirements of NEPA, including the preparation of the draft and final EA and management of the project timeline.

B. USMC will have primary responsibility for consultations under the National Historic Preservation Act, Endangered Species Act, Coastal Zone Management Act, Magnuson Stevens Act, and other applicable requirements, in coordination with the Service. Any consultation should be agreed upon with the Service prior to submittal.

C. To help coordinate and plan future outcomes, the Service requests that USMC develop a project schedule for the NEPA process, setting milestones for environmental reviews and authorizations.

D. USMC has developed the draft EA in consultation with the Service. The Service appreciates the opportunity to review the full draft once complete, and requests that USMC provide adequate time for agency review and comment before the draft EA is released to the public.

E. Due to the complexity and public interest in this project, the Service believes that a public meeting would benefit those affected by the relocation of refuge facilities. As such, the Service requests that USMC lead an informational public meeting during the public comment period, and will coordinate the timing and location with the Service.

F. After the public comment period closes, the Service requests that USMC identify and provide comments pertaining to our special expertise or regulatory authority for agency input. The ability to view and provide input on draft comments will help the Service support USMC in incorporating and responding to questions and concerns about this project.

G. USMC will provide the Service with draft sections of the final EA for review, and will consider the Service's comments received during preparation of the final EA. The agencies will work together to address any comments, concerns, or issues.

COOPERATING AGENCY RESPONSIBILITIES (U.S. Fish and Wildlife Service)

A. The Service will actively participate in the NEPA process and the development of the draft and final EA.

B. The Service will participate in the development of a robust public engagement plan and will participate as a cooperating agency in any informational public meetings held during the NEPA process. 3

C. The Service will coordinate with USMC in development of the project schedule, purpose and need, and alternatives.

D. In consultation with USMC, the Service will prepare or contribute to portions of the draft and final EA that are relevant to the agency's special expertise, authorities, jurisdiction by law, or management oversight.

E. The Service will provide comments on the draft and final EA within agreed upon timelines, prior to public release.

F. The Service will coordinate to support timely development and approval of consultations related to the proposed action and support the development of the EA within the agreed upon schedule.

UNITED STATES MARINE CORPS
MARINE CORPS INSTALLATIONS COMMAND
3000 MARINE CORPS PENTAGON
WASHINGTON DC 20350-3000

IN REPLY REFER TO:
12330
MCICOM SS
10 Feb 23

From: Todd Armsworth, Branch head, Defense Policy Review Initiative /Pacific Posture (DPRI/PP)
To: Robert Reed
Deputy Center Director,
Pacific Island Ecosystems Research Center
U.S. Geological Survey
Kilauea Field Station
P.O. Box 44
Building 344
Hawai'i National Park, HI 96718

SUBJECT: COOPERATING AGENCY FOR THE ENVIRONMENTAL ASSESSMENT (EA) FOR THE CONSTRUCTION OF FACILITIES AND ASSOCIATED INFRASTRUCTURE AT THE GUAM NATIONAL WILDLIFE REFUGE, RITIDIAN UNIT, GUAM

Enclosure (1): 14 May 2020 MOA

Dear Mr. Reed,

The U.S. Marine Corps (USMC) is initiating the preparation of an Environmental Assessment (EA) for the proposed relocation of the United States Fish and Wildlife Service (USFWS) Facility (including United States Geological Survey (USGS) functions) in the Ritidian Unit of the Guam National Wildlife Refuge (GNWR). The Marine Corps requests formal participation by the USGS as a cooperating agency in the preparation of the Refuge Facility Replacement EA, as prescribed in the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (NEPA), Title 40 Code of Federal Regulations (CFR) 1501.8. The USMC is requesting USGS participation in the NEPA process based on USGS functions and mission included in the proposed action, and co-signatory of the enclosed Memorandum of Agreement (MOA).

In 2015 the Department of the Navy (DON) signed a Record of Decision (ROD) to support Marine Corps relocation to Guam. As part of that action, LFTRC Surface Danger Zones (SDZ) will overlay a portion of the Ritidian Unit including the access road to the GNWR Ritidian Unit and existing GNWR facilities used by USFWS and USGS staff.

Section 2822 (*Establishment of Surface Danger Zone, Ritidian Unit, Guam National Wildlife Refuge*) of the National Defense Authorization Act for Fiscal Year 2015, Public Law 113-291 (hereinafter "FY15 NDAA"), provided for the establishment of an agreement between the USFWS and the Department of Defense (DoD) "in order to accommodate the

operation of a live-fire training range complex on Andersen Air Force Base- Northwest Field and the management of the Ritidian Unit of the Guam National Wildlife Refuge", and "the establishment and operation of a surface danger zone which overlays the Ritidian Unit or such portion thereof." The FY15 NDAA also provided for the "relocation and reconstruction of structures and facilities of the Refuge in existence as of the date of the Act."

In May 2020, DON, USGS and USFWS entered into a MOA to accommodate establishment of the SDZ (Enclosure (1)). In that MOA the DON made several commitments including building USFWS/USGS replacement facilities, demolishing existing facilities, conducting an initial planting of native vegetation on the existing site, and transferring the replacement facilities to DOI.

As the lead agency, the USMC will prepare the Refuge Replacement Facility EA and will be responsible for scoping, developing, and managing the EA process. USMC will also work with the USFWS and USGS to evaluate potential action alternatives and environmental impacts.

As a cooperating agency, the USMC requests the following USGS support:

- Designation of a representative to serve on the Refuge Replacement Facility EA Interdisciplinary Project Team (IPT);
- Providing information on replacement facility and operation requirements, preferred and potential alternative sites, and existing pertinent information on brown treesnake within the GNWR Ritidian Unit and on Guam;
- Providing timely comments throughout the EA process, to include making staff support available to enhance EA interdisciplinary analysis and review;
- Providing response to USMC requests for information within 21 days of receipt;
- Participating, as necessary, in meetings hosted by the USMC; and
- Participating in the public involvement process.

We look forward to continuing our partnership with the USGS on this longstanding matter. Should you have any questions regarding this request, please contact Jacque Rice, Natural Resources Program Lead, Headquarters, U.S. Marine Corps at 571-256-2796. .

.

Sincerely,

ARMSWORTH.TODD.ADKINS.1131338429 Digitally signed by ARMSWORTH.TODD.ADKINS.1131338429 Date: 2023.02.10 14:14:03 -05'00'

Copy to:
DASN (E&MR)
DASN (IF&E) Pacific Programs Office
MARFORPAC
Joint Region Marianas
MCB CAMP BLAZ

2

U.S. Fish and Wildlife Service, Pacific Island Field Office (Attn: Earl Campbell, Field Supervisor, Ecological Services)
U.S. Fish and Wildlife Service, Region 1 (Attn: Christine Ogura, Acting Assistant Regional Director, National Wildlife Refuge System)

3

This page intentionally left blank.

Appendix H: References

AAFB. 2008. Final Mariana Fruit Bat (Pteropus mariannus mariannus) Management Plan for Andersen Air Force Base, Guam. Prepared for 36 CES, Environmental Flight, AAFB, Guam and Air Force Center for Engineering and the Environment, Hickam AFB, HI. August.

Aziz, S.A., K.R. McConkey, K. Tanalgo, T. Sritongchuay, M.R. Low, J.Y. Yong, T.L. Mildenstein, C.E. Nuevo-Diego, V.C. Lim, and P.A. Racey. 2021. The critical importance of Old World fruit bats for healthy ecosystems and economies. *Frontiers in Ecology and Evolution*, 9, p.181.

Almeida, F.C., N.P. Giannini, N.B. Simmons, and K.M. Helgen. 2014. Each flying fox on its own branch: a phylogenetic tree for Pteropus and related genera (Chiroptera: Pteropodidae). *Molecular Phylogenetics and Evolution*, 77, 83-95.

Bartol, S. and D.R. Ketten. 2006. Turtle and tuna hearing. In: Swimmer Y. and R. Brill (Eds), Sea turtle and pelagic fish sensory biology: developing techniques to reduce sea turtle bycatch in longline fisheries. NOAA Tech Memo NMFS-PIFSC-7, P 98-105.

Bayman, J.M., H. Kurashina, M.T. Carson, J.A. Peterson, and D.J. Doig. 2010. University of Guam and University of Hawaii Archaeological Field School at the Guam National Wildlife Refuge, Ritidian Unit, Territory of Guam: The 2009 and 2008 Seasons. Prepared for the Guam National Wildlife Refuge. March 22.

Bayman, J.M., H. Kurashina, M.T. Carson, J.A. Peterson, D.J. Doig, and J. Drengson. 2012. Latte Household Economic Organization at Ritidian, Guam National Wildlife Refuge, Mariana Islands. *Micronesica* 42(1/2):258-273.

Bureau of Land Management. 1986. Bureau of Land Management Manual 8431 – Visual Resource Contrast Rating.

Caltrans. 2020. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Available at: https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/hydroacoustic-manual-a11y.pdf. Accessed August 17, 2023.

Carson, M. 2014. Contexts of natural-cultural history: A 3500-year record at Ritidian in Guam. In Guam's Hidden Gem: Archaeological and Historical Studies at Ritidian, edited by Mike T. Carson, pp. 1-43. British Archaeological Reports, International Series 2663. Archaeopress, Oxford.

__. 2016. Archaeological Landscape Evolution: The Mariana Islands in the Asia-Pacific Region. Springer International, Cham, Switzerland.

__. 2017a. Rediscovering heritage through artefacts, sites, and landscapes: translating a 3500-year record at Ritidian, Guam. Access Archaeology Series. Oxford: Archaeopress.

__. 2017b. Cultural Spaces Inside and Outside Caves: A Study in Guam, Western Micronesia. *Antiquity* 91 356:421–441.

__. 2018. *Lina'la' Portraits of Life at Litekyan*. Micronesian Area Research Center, University of Guam Press.

__. 2022. Preliminary Draft Archaeological Resource Text Excavations at Two Cave Areas in the Ritidian Unit of Guam National Wildlife Refuge. Prepared for USFWS. July.

Carson, M., B. Dixon, J. Peterson, and A. Jalandoni. 2014. "Site Definitions in a Complex Archaeological Landscape: An Example at Ritidian, Guam." In M. Carson (editor) Guam's Hidden Gem: Archaeological and Historical Studies at Ritidian. British Archaeological Review International Series 2663. *Oxford*:105-111.

Carson, M., J. Bayman, C. Ledesma, J. Moore, H. Kurashina, S. Monton-Subias, and J. Peterson. 2015. Archaeological Resource Survey of 27.02 hectares at the Eastern Portion of the Ritidian Unit of Guam National Wildlife Refuge. Report prepared for the U.S. Fish and Wildlife Service (USFWS). Micronesian Area Research Center (MARC), University of Guam (UOG), Mangilao, Guam.

CEQ. 1997. Environmental Justice Guidance Under the National Environmental Policy Act. Available at: https://www.epa.gov/sites/default/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf. Accessed June 21, 2023.

CEQ. 2024. National Environmental Policy Act Implementing Regulations Revisions Phase 2. Published in Federal Register Volume 89, Number 85 on May 1, 2024. Available at: https://www.govinfo.gov/content/pkg/FR-2024-05-01/pdf/2024-08792.pdf.

Demeulenaere, E., M. Putnam, and G.C. Fiedler. 2018. Conservation Management of the Mariana Eight Spot Butterfly. University of Guam.

Dixon, B. 2000. Archaeological Survey and Testing of a Proposed Brown Tree Snake Pen, Guam National Wildlife Refuge, Ritidian Point, Territory of Guam, Mariana Islands. Report prepared for USGS-BRO. International Archaeological Research Institute, Inc., Honolulu, HI. [GSHPO Catalogue No. 2000-0 I 0-AST].

Dixon, B., T. Rudolph, A. Jalandoni, I. Nelson, M. Hroncich-Conner, S. Leary, R., Schaefer, E. Lash, and M. Todd. 2015. Final Technical Report Proposed Guam and CNMI Military Relocation 2012 Roadmap Adjustments SEIS Live-Fire Training Range Complex Footprints, Main Cantonment, Utilities, Communications, Well Field Alternatives and Access Route Options Volume I: Potential Direct Impact Area In-Fill Cultural Resources Study Narrative. Prepared for Naval Facilities Engineering Command Pacific by Cardno TEC, Inc., Honolulu, Hawai'i.

Dixon, B. and I. Nelson. 2022a. Final Archaeological Survey and Discovery Plan for Archaeological Subsurface and Surface Survey in Support of P-745, USFWS Building Relocation, Ritidian Unit, Yigo, Guam. Prepared for Naval Facilities Engineering Systems Command, Pacific. July 8.

__. 2022b. Final Site Condition Assessment of Sites and Features at Litekyan (Ritidian) In Support of P-745, USFWS Building Relocation, Ritidian Unit, Yigo, Guam. Prepared for Naval Facilities Engineering Systems Command, Pacific. December 2.

Dixon, B., I. Nelson, K. Briscoe, and S. Gabitzer. 2023. Final Technical Report, Archaeological Subsurface and Surface Survey in support of P-745, USFWS Building Relocation, Ritidian Unit, Yigo, Guam. Prepared for Naval Facilities Engineering Systems Command, Pacific. July.

DON. 2010. Final Environmental Impact Statement for Guam and Commonwealth of the Northern Mariana Islands Military Relocation, Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing, and Army Air and Missile Defense Task Force. July.

__. 2015. Final Supplemental Environmental Impact Statement Guam and Commonwealth of the Northern Mariana Islands Military Relocation (2012 Road Map Adjustments). May.

Federal Emergency Management Agency. 2007. Flood Insurance Rate Map, Territory of Guam. Panel 25 of 206. Map No. 6600010025D. September 28.

Federal Highway Administration. 2006. Roadway Construction Noise Model User's Guide. January.

Federal Interagency Committee on Urban Noise. 1980. Guidelines for Considering Noise in Land Use Planning and Control. June.

Government of Guam. 2009. Endangered Species Regulation No. 9. Department of Agriculture, Mangilao, GU. November 6.

Grecni et. al. 2020. Climate Change in Guam: Indicators and Considerations for Key Sectors. Report for the Pacific Islands Regional Climate Assessment. Retrieved from https://www.eastwestcenter.org/PIRCA-GUAM.

Griffin, A., M. Carson, and J. Peterson. 2010. A study of Potential Traditional Cultural Properties in Guam. Prepared for Department of the Navy, Naval Facilities Engineering Command Pacific, Pearl Harbor, HI. May.

Guam Bureau of Statistics and Plans. 2022. Guidance on Using 2020 Island Areas Censuses Data from the U.S. Census. Available at: https://bsp.guam.gov/census-of-guam/. Accessed June 12, 2023.

__. 2011. Procedures Guide for Achieving Federal Consistency with the Guam Coastal Management Program. August 1982, Revised May 2011. Available at: https://bsp.guam.gov/wp-bsp-content/uploads/2021/02/Federal-Consistency-Guidebook.pdf. Accessed February 03, 2023.

Guam Department of Labor. 2023a. HireGuam Local Area Unemployment Statistics – Unemployment Rate. Available at: https://www.hireguam.com/vosnet/analyzer/resultsNew.aspx?session=labforce&lmidbl=1. Accessed June 14, 2023.

__. 2023b. Economic Outlook for Guam Fiscal Year 2024. Available at: https://bls.guam.gov/wp-content/uploads/bsk-pdf-manager/2023/02/EconOutlookFY2024.pdf. Accessed June 15, 2023.

Guam Division of Aquatic and Wildlife Resources. 2006. Comprehensive Wildlife Conservation Strategy. Department of Agriculture, Government of Guam, Mangilao, GU. November.

Guam National Wildlife Refuge and USFWS. 2009. Guam National Wildlife Refuge Comprehensive Conservation Plan. September.

Habana, N.C., L.F. Heitz, and D.K.U. Valerio. 2022. Surface Hydrology of the Northern Guam Lens Aquifer. February.

Hopper, D.R. and B.D. Smith. 1992. Status of Tree Snails (Gastropoda: Partulidae) on Guam, with a Resurvey of Sites Studied by H.E. Crampton in 1920. Pacific Science, 46:77–85.

Jalandoni, A. 2011. Casa Real or Not Real? A Jesuit Mission House in Guam. Master's Thesis, Archaeological Studies Program, University of the Philippines Diliman, Quezon City.

JRM. 2022. Joint Region Marianas Integrated Natural Resources Management Plan. March.

Jones, G., and E.C. Teeling. 2006. The evolution of echolocation in bats. *Trends in Ecology & Evolution,* 21(3), 149-156.

Keener, V., Gingerich, S., & Finucane, M. 2015. Climate Trends and Projections for Guam. Honolulu, HI: East West Center information sheet.

King, R., M. Higgs, III, K. Bautista, and E. Leon-Guerrero. 2020. Using Local Early Action Planning (LEAP) to Inform Climate Vulnerability Assessments – Guam 2019. *Pacific Asia Inquiry*, 11.1:107. Fall 2020.

Klose, S.M., C.L. Smith, A.J. Denzel, and E.K. Kalko. 2006. Reproduction Elevates the Corticosterone Stress Response in Common Fruit Bats. *Journal of Comparative Physiology A,* 192, 341-350.

Kurashina, H., J. Simons, J. Toenjes, J. Allen, S. Amesbury, G. Heathcote, R. Randall, B. Smith, R. Stevenson, and E. Wells. 1990. Archaeological Investigations at the (NAVFAC), Ritidian Point, Guam, Mariana Islands. Prepared for HNC Architects by University of Guam, Mangilao, and Bernice P. Bishop Museum, Honolulu.

Larkin, R.P., L.L. Pater, and D.J. Tazlk. 1996. Effects of Military Noise on Wildlife: A Literature Review (USACERL Technical Report 96/21). Champaign, IL: Department of the Army, Construction Engineering Research Lab.

Mancera, K.F. and C.J. Phillips. 2023. Effects of noise and light. Health and Welfare of Captive Reptiles (pp. 357-378). Cham: Springer International Publishing.

Marine Corps Base Camp Blaz. 2023. Annual Report for the Biological Opinion for the Department of the Navy's Relocation of the U.S. Marine Corps from Okinawa to Guam and Associated Activities on Guam. Reporting Period – October 1, 2022 to September 30, 2023 (FY 2023).

Marler, T.E., and M. V. Krishnapillai. 2020. Longitude, forest fragmentation, and plant size influence Cycas micronesica mortality following island insect invasions. *Diversity* 12.5:194.

Mildenstein, T. and J. Boland. 2010. Development of Mariana fruit bat survey protocols for Mariana Island surveys, final report prepared for USFWS-Rota Island pilot surveys.

Murugavel, B., S. Kandula, H. Somanathan, and A. Kelber. 2023. Home ranges, directionality and the influence of moon phases on the movement ecology of Indian flying fox males in southern India. *Biology Open,* 12(2), bio059513.

National Oceanic and Atmospheric Administration. 2023. Available at: https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines/guidelines-&-distances. Accessed August 14, 2023.

National Park Service. 1994. Report on Effects of Aircraft Overflights on the National Park System (Report to Congress prepared pursuant to Public Law 100-191, the National Parks Overflights Act of 1987). Washington, DC: National Park Service.

Natural Resources Conservation Service. 2022. Natural Resources Conservation Service Web Soil Survey. Available at: https://websoilsurvey.nrcs.usda.gov/app/. Accessed December 09, 2022.

NAVFAC Marianas. 2013. Threatened and Endangered Species and Migratory Birds Monitoring Report, Naval Support Activity Andersen, Guam. Prepared by HDR Inc., San Diego, CA. February.

NAVFAC Marianas and AAFB. 2015. Monitoring Mariana Fruit Bats on AFB 2015. Prepared by T. Mildenstein and R. Miller, Biology Program, UOG. July.

NAVFAC Pacific. 2010. Natural Resource Survey Report in Support of the Environmental Impact Statement for the Marine Corps Relocation Initiative to Various Locations on Guam, Final. Pearl Harbor, HI.

__. 2013. Biological Surveys - Report 2, Various Locations on Guam in Support of the Guam and Commonwealth of the Northern Mariana Islands Military Relocation (2012 Roadmap Adjustments) Supplemental Environmental Impact Statement. Prepared for Joint Guam Program Office, Washington, DC by TEC-AECOM Pacific Joint Venture, Honolulu, HI. April.

__. 2023. Biological Evaluation of Soil Borings, Topographic Surveys and Environmental Soil Screening at the Ritidian Unit of the Guam National Wildlife Refuge, Guam.

__. 2024a. Greenhouse Gas Emissions Calculations for P-745 EA. August 2024.

__. 2024b. Final Biological Assessment for the Relocation and Reconstruction of Structures, Facilities and Associated Infrastructure at the Guam National Wildlife Refuge, Ritidian Unit. July.

Office of the Governor. 2022. Leon Guerrero-Tenorio Administration Welcomes Historic H-2B Milestone. Press Release August 25, 2022. Available at: https://governor.guam.gov/press_release/leon-guerrero-tenorio-administration-welcomes-historic-h-2b-milestone/. Accessed June 13, 2023.

Piniak, W.E.D., D.A. Mann, C.A. Harms, T.T. Jones, and S.A. Eckert. 2016. Hearing in the Juvenile Green Sea Turtle (Chelonia mydas): A Comparison of Underwater and Aerial Hearing Using Auditory Evoked Potentials. *PLoS ONE* 11(10): e0159711.doi:10.1371/journal.pone.0159711.

Pobutsky, A.M. and E.I. Neri. 2014. Cultural Integration and Separation: The Pre-historical and Historical Links between Guam and the Philippines, or Where Did All the Filipinos Go? *Philippine Quarterly of Culture and Society* 42:1-15.

Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, and M.B. Halvorsen. 2014. ASA S3/SC1. 4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report Prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI: Springer.

Pratt, H.D., P.L. Bruner, and D.G. Berrett. 1987. The birds of Hawaii and the tropical Pacific. Princeton University Press, Princeton, NJ.

Reinman, F. 1977. An Archaeological Survey and Preliminary Test Excavations on the Island of Guam, Mariana Islands, 1965-1966. Miscellaneous Publications No.1. Micronesian Area Research Center, University of Guam, Mangilao, Guam.

Rubinoff, D. and B. Holland. 2018. The Conservation Status of Two Endangered Mariana Butterflies, Hypolimnas octocula marianensis and Vagrans egistina (Nymphalidae). *The Journal of the Lepidopterists' Society*, 72(3), 218-226.

Scheuerman, C. and C. Camacho. 2022. Final Survey Report for P-745 Surveys of Federally Listed Species at Guam National Wildlife Refuge, Guam. Prepared by Cardno GS for NAVFAC Pacific under Contract N62742-18-D-1802, Task Order N6274221F0187. March.

Schreiner, I.H. and D.M. Nafus. 1996. Survey of rare butterflies in the Mariana Islands. Preliminary report to USFWS. Unpublished report.

Shannon, G., M.F. McKenna, L.M. Angeloni, K.R. Crooks, K.M. Fristrup, E. Brown, K.A. Warner, M.D. Nelson, C. White, J. Briggs, and S. McFarland. 2016. A synthesis of two decades of research documenting the effects of noise on wildlife. *Biological Reviews*, 91(4), pp.982-1005.

Shintia, I., T. Hestirianoto, D.M. Wildan, C.P.H. Simanjuntak, and D. Islami. 2021. Sound character of the coconut crab (*Birgus latro*) of Bacan Island. In IOP Conference Series: Earth and Environmental Science (Vol. 744, No. 1, p. 012076). IOP Publishing.

SWCA. 2012. Final summary report; Noise study and demographic survey of Mariana fruit bats and Mariana crows, Anderson Air Force Base, Guam. Prepared by SWCA. May 11, 2012.

USCB. 2001. 2000 Final Population Totals. Release date: July 3, 2001. Available at: https://www.census.gov/newsroom/releases/archives/census_2000/cb01cn174.html. Accessed June 12, 2023.

__. 2021a. 2020 Island Areas Censuses: Guam. Population and Housing Unit Counts. Table 1: Population of Guam 2010 and 2020. Release date: October 28, 2021. Available at: https://www.census.gov/data/tables/2020/dec/2020-guam.html. Accessed June 12, 2023.

__. 2021b. 2020 Island Areas Censuses: Guam. Population and Housing Unit Counts. Table 3: Housing Unit Counts of Guam: 2010 and 2020. Release date: October 28, 2021. Available at: https://www.census.gov/data/tables/2020/dec/2020-guam.html. Accessed June 12, 2023.

__. 2021c. U.S. Census Bureau QuickFacts: United States. Available at: https://www.census.gov/quickfacts/fact/table/US/AGE295222. Accessed February 6, 2023.

__. 2022a. 2020 Island Area Censuses: Guam. Table DP-1: General Demographic Characteristics. Available at: https://data.census.gov/table?g=040XX00US66&d=DECIA+Guam+Demographic+Profile&tid=DECENNIALDPGU2020.DP1. Accessed February 7, 2023.

__. 2022b. 2020 Island Area Censuses: Guam. Table DP-3: Selected Economic Characteristics. Available at: https://data.census.gov/table?g=040XX00US66&d=DECIA+Guam+Demographic+Profile&tid=DECENNIALDPGU2020.DP3. Accessed February 7, 2023.

U.S. Citizenship and Immigration Services. 2023a.H-2B Temporary Non-Agricultural Workers Period of Stay. Available at: https://www.uscis.gov/working-in-the-united-states/temporary-workers/h-2b-temporary-non-agricultural-workers#:~:text=The%20maximum%20period%20of%20stay,as%20an%20H%2D2B%20nonimmigrant. Accessed June 13, 2023.

__. 2023b. Policy Manual Volume 2, Part I, Chapter 11. Temporary Nonagricultural Worker (H-2B) Petitions Requiring Special Handling. Available at: https://www.uscis.gov/policy-manual/volume-2-part-i-chapter-11. Accessed June 13, 2023.

U.S. Department of Agriculture. 1988. USDA Soil Conservation Service Soil Survey of Territory of Guam. May.

USEPA. 1998. Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses. Available at: https://www.epa.gov/sites/default/files/2014-08/documents/ej_guidance_nepa_epa0498.pdf. Accessed February 7, 2023.

__. 1999. Final Guidance for Consideration of Environmental Justice in Clean Air Act 309 Reviews. Available at: https://www.epa.gov/sites/default/files/2014-08/documents/enviro_justice_309review.pdf. Accessed February 7, 2023.

__. 2013a. Personal communications, D. Brzezinski. May 30, 2013.

__. 2013b. Environmental Justice. Last updated February 11, 2013. Available at: http://www.epa.gov/compliance/environmentaljustice/index.html. Accessed February 22, 2013.

__. 2016. Promising Practices for EJ Methodologies in NEPA Reviews. Available at: https://www.epa.gov/environmentaljustice/ej-iwg-promising-practices-ej-methodologies-nepa-reviews. Accessed June 16, 2023.

__. 2022. Guam Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants. Available at: https://www3.epa.gov/airquality/greenbook/anayo_gu.html. Accessed January 24, 2023.

__. 2023. Latest Version of Motor Vehicle Emission Simulator (MOVES). Available at: https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves. Accessed August 9, 2024.

__. 2024. Greenhouse Gas Equivalencies Calculator. Updated January 2024. Available at: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator. Accessed August 9, 2024.

USFWS. 2004. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Mariana Fruit Bat and Guam Micronesian Kingfisher on Guam and the Mariana Crow on Guam and in the Commonwealth of the Northern Mariana Islands; Final Rule. 2004. 69 Fed. Reg. 208 (October 28, 2004) (to be codified at 50 CFR part 17).

__. 2009. Guam National Wildlife Refuge Comprehensive Conservation Plan. Region 1, Portland, OR. September.

__. 2014. Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for 21 Species and Proposed Threatened Status for 2 Species in Guam and the Commonwealth of the Northern Mariana Islands; Proposed Rule. 2014. 79 Fed. Reg. 59363 (October 01, 2014) (to be codified at 50 CFR part 17).

__. 2017. Marine Relocation Final Biological Opinion. Reinitiation of the 2015 Biological Opinion on the Department of the Navy's Relocation of U.S. Marine Corps from Okinawa to Guam and Associated Activities on Guam. July 18.

__. 2020a. 5-Year Review, Summary and Evaluation of *Cycas Micronesica* (fadang, faadang). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020b. 5-Year Review, Summary and Evaluation of *Tabernaemontana rotensis* (no common name). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020c. 5-Year Review, Summary and Evaluation of Humped Tree Snail (*Partula gibba*). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020d. 5-Year Review, Summary and Evaluation of Fragile Tree Snail (*Samoana fragilis*). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020e. 5-Year Review, Summary and Evaluation of Guam Tree Snail (*Partula radiolata*). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2020f. 5-Year Review, Summary and Evaluation of Mariana eight-spot butterfly (*Hypolimnas octocula marianensis*). Pacific Islands Fish and Wildlife Office, Honolulu, HI.

__. 2022. Environmental Conservation Online System (ECOS). Available at: https://ecos.fws.gov/ecp/. Accessed February 17, 2022.

__. 2023a. No common name (*Tabernaemontana rotensis*). Life History. Available at: https://ecos.fws.gov/ecp/species/2542#bo. Accessed on July 31, 2023.

__. 2023b. Mariana fruit Bat (Mariana flying fox) (*Pteropus mariannus mariannus*). Environmental Conservation Online System. Available at: https://ecos.fws.gov/ecp/species. Accessed on August 10, 2023.

__. 2023c. Animal Avoidance and Minimization Measures, May 2023. Available at: https://www.fws.gov/media/animal-avoidance-and-minimization-measures-may-2023-0. Accessed July 10, 2023.

__. 2023d. Guam National Wildlife Refuge homepage. Available at: https://www.fws.gov/refuge/guam. Accessed on February 3, 2023.

U.S. Forest Service. 2006. Guam Vegetation Mapping. 3rd Edition. Pacific Southwest Region, Forest Health Protection, McClellan, CA. October.

United States Geological Survey. 2019. Water Resources on Guam - Potential Impacts of and Adaptive Response to Climate Change. Reston, VA: United States Geological Survey.

University of Guam. 2014. Final Project Report - Federal Candidate Species Surveys on Guam. Prepared for NAVFAC Marianas, Guam. January.

__. 2019. Ficus tintoria. Cooperative Extension & Outreach, College of Natural & Applied Sciences, Guam.

University of Rhode Island and Inner Space Center. 2023. Discovery of Sound in the Sea: How does sound propagate from air to water? Available at: https://dosits.org/science/movement/how-does-sound-propagate-from-air-into-water/. Accessed August 15, 2023.

Villareal, M.J., J.W. Jenson, R. King, and J.E. Aban. 2022. Hydrogeological Characterization of a high-discharge coastal freshwater karst spring system. May.

Wiles, G.J. 1987. The Status of Fruit Bats on Guam. *Pacific Science* 41:1-4.

Wiles, G.J., C.F. Aguon, G.W. Davis and D.J. Grout. 1995. The status and distribution of endangered animals and plants in northern Guam. *Micronesica*, 28(1), 31-49.

Witherington, B.E. and K.A. Bjorndal. 1991. Influences of wavelength and intensity on hatchling sea turtle phototaxis: implications for sea-finding behavior. *Copeia*, pp.1060-1069.

World Sea Temperatures. 2022. Retrieved from https://www.seatemperature.org/australiapacific/guam/tamuning-tumon-harmon-village.htm.

This page intentionally left blank.

Appendix I: Distribution List

This Draft EA was distributed to the agencies and organizations listed below.

Government Agencies – Federal

U.S. Fish and Wildlife Service

U.S. Geological Survey

Government Agencies – Guam

Guam Bureau of Statistics and Plans

Guam Coastal Zone Management Program

Guam Department of Agriculture

Guam Department of Land Management

Guam Department of Parks and Recreation, Historic Resources Division

Guam Division of Aquatic and Wildlife Resources

Guam Environmental Protection Agency

Guam State Historic Preservation Office

Libraries

Dededo Public Library

Nieves M. Flores Memorial Library

This page intentionally left blank.

Appendix J: List of Preparers and Contributors

J.1 List of Preparers

The following team of NEPA consultants prepared this EA under the direction of Naval Facilities Engineering Command (NAVFAC) Pacific:

Peer Amble, Quality Assurance, Hazardous Materials and Waste, Public Health and Safety

Ben Barna, Cultural Resources

Craig Bloxham, Project Management

Kevin Butterbaugh, Recreation and Visual Resources

Jackie Clark, Technical Editor and Public Involvement

Stephanie Clarke, Geographic Information Systems/Graphics

Scott Coombs, Water Resources and Geological Resources

Dan Cronquist, Utilities

Sasha Forland, Project Management, Land Use

Tania Fragomeno, Public Involvement

Delphine Homerowski, Geographic Information Systems/Graphics

Hannah Hubanks, Terrestrial Biological Resources

Bruce Ikelheimer, Noise

Carlos Kelton, Land Use and Recreation

Patrick Kester, Noise

Claudia Laughlin, Graphic Design and Public Involvement

Leah McCormick, Water Resources and Geological Resources

Isla Nelson, Cultural Resources

Lily Nazareno, Technical Editor

Oliver Pahl, Socioeconomics and Environmental Justice

Selena Qiu, Visual Resources

Leela Rajaseker, Transportation

Clint Scheuerman, Biological Resources

Tessa Stefanisko, Air Quality and Utilities

Stephen Wenderoth, NEPA, Quality Assurance

Kim Wilson, Technical Editor

Fang Yang, Air Quality and GHG Emissions

Jefferson Young, Transportation

J.2 List of Contributors

The U.S. Fish and Wildlife Service contributed to the preparation of this EA as a cooperating agency. The following DON personnel contributed to the preparation of this EA via project management, technical and editorial reviews, and/or subject matter expertise:

U.S. Marine Corps

Connie Barnett, Headquarters Marine Corps

Albert Borja, Marine Corps Base Camp Blaz

Thomas Bucci, Marine Corps Base Camp Blaz

Jean Chabanne, Marine Corps Base Camp Blaz

Matthew Gagelin, Headquarters Marine Corps

Lisa Graham, Headquarters Marine Corps

Hedy Justus, Marine Corps Base Camp Blaz

Lynn Long, Headquarters Marine Corps

Cara Myrick, Headquarters Marine Corps

Jacque Rice, Headquarters Marine Corps

Maj Diann Rosenfeld, Marine Corps Base Camp Blaz

Richard Salas, Marine Corps Base Camp Blaz

Jennifer Scarborough, Headquarters Marine Corps (Contractor Support)

Phil Villarreal, Marine Corps Base Camp Blaz

U.S. Navy

John Bigay, NAVFAC Pacific

Coralie Cobb, NAVFAC Marianas

Emil Dacayanan, NAVFAC Pacific, Guam Program Management Office

Steven Daugherty, NAVFAC Pacific

Garwin Eng, NAVFAC Pacific, Guam Program Management Office

Richard Gray, NAVFAC Pacific, Guam Program Management Office

Adam Lauer, NAVFAC Pacific

Mark Nakagawa, NAVFAC Pacific

Jennifer Oelke Farley, U.S. Navy

Lorraine Shaughnessy, NAVFAC Pacific

Alan Suwa, NAVFAC Pacific

Jolene Velasco, NAVFAC Pacific

Michelle Yoshioka, NAVFAC Pacific, Guam Program Management Office